DISSERTATION ON

MR EVALUATION OF UTERINE MASS LESIONS IN CORRELATION WITH TRANSABDOMINAL, TRANSVAGINAL ULTRASOUND USING HPE AS A GOLD STANDARD

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CERTIFICATE

This is to certify that this dissertation entitled "**MR EVALUATION OF UTERINE MASS LESIONS IN CORRELATION WITH TRANSABDOMINAL, TRANSVAGINAL ULTRASOUND USING HPE AS A GOLD STANDARD"** submitted by **Dr.J.DEVIMEENAL,** appearing for **Part-II MD BRANCH VIII – RADIODIAGNOSIS DEGREE EXAMINATION IN FEBRUARY 2006** is a bonafide record of work done by her under my direct audience and supervision in partial fulfilment of regulations of the **TAMILNADU Dr. M.G.R.MEDICAL UNIVERSITY,** Chennai. I forward this to the Tamilnadu Dr. M.G.R. Medical University, Chennai, Tamilnadu, India.

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DECLARATION

I declare that this dissertation titled **"MR EVALUATION OF UTERINE MASS LESIONS IN CORRELATION WITH TRANSABDOMINAL, TRANSVAGINAL ULTRASOUND USING HPE AS A GOLD STANDARD"** has been conducted by me under the guidance and supervision of **PROF. T.S. SWAMINATHAN, M.D., D.M.R.D., F.I.C.R.** It is submitted in part of fulfilment of the requirement for the award of the M.D., Radiodiagnosis, February 2006 examination to be held under Dr. M.G.R. Medical University, Chennai. This has not been submitted previously by me for the award of any degree or diploma from any other University.

DR. J.DEVIMEENAL.

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CONTENTS

INTRODUCTION

Mass lesions in the uterus are a commonly encountered problem all over the world. 15 to 20% of women in the reproductive age group have mass lesions in the uterus[38]. In the Institute of Obstetrics and Gynaecology, Egmore, Chennai, about 800 hysterectomies were done for benign pathology in the year 2004. Among them 45% had fibroid uterus and 25% had adenomyosis. But less than 5% of total adenomyosis cases were diagnosed by Transabdominal ultrasound alone preoperatively. This necessitated the definitive preoperative diagnosis of adenomyosis.

Over the years many imaging modalities like Transabdominal ultrasound, Transvaginal ultrasound, Colour Doppler, Hysterosonosalphingography, Computerised Tomography, Magnetic Resonance Imaging have been tried to characterise the mass lesions. Even today Transabdominal ultrasound is the screening imaging modality of choice.

Definitive characterisation of the lesion is important to decide on the treatment modality. For example, in case of myoma, myomectomy or hysterectomy can be done. But in case of Adenomyosis, hysterectomy is the treatment of choice for definitive cure[38,18]. This states the need for a definitive preoperative diagnosis.

In cases of submucosal fibroid, if the endometrial surface circumference is more than 50% it can be resected hysteroscopically[18]. Otherwise it should be resected laparoscopically. The same way for intramural fibroids, depending on the number and site of the lesion, laparoscopic resection or hysterectomy can be planned. It states the need for exact location and extent of the lesion by various measurements like size and circumference.

To some extent the questions were answered by Transvaginal ultrasound but it depends on the operator and large lesions cannot be brought within the field of Transvaginal ultrasound.

Hysterosonosalphingography is useful only in endometrial lesions. CT is utilized to evaluate uterine lesion mainly in staging the carcinomas. The continuing need for better imaging modality for definitive characterisation of uterine mass lesions lead to the use of MRI as a diagnostic tool in preoperative evaluations. MRI is a recently devised modality which is done in sagittal, axial and coronal planes using body surface coil in T1, T2 weighted sequences.

This study involves detailed evaluation of uterine mass lesions like number, location, size, other measurements, degenerative changes within the lesions, extent of the lesion using Transabdominal ultrasound, Transvaginal ultrasound & MRI. Final diagnosis by imaging was compared with histopathological reports. Comparisons were made between the three modalities for 1. detection sensitivity of each parameter, 2. characterisation & differentiation between lesions, 3. sensitivity & specificity of each modality to make final diagnosis against HPE reports.

AIM

1. To evaluate the MRI characteristics of uterine mass lesions.
2. To compare the sensitivity of MRI, Transabdominal ultrasound, Transvaginal ultrasound in characterising the uterine mass lesions.
3. To assess the accuracy in staging the malignant mass lesions.

REVIEW OF LITERATURE

Uterus is a hollow thick walled muscular organ consisting of muscle layer myometrium and inner mucosal layer endometrium and outer peritoneal surface perimetrium[37,38]. Myometrium forms most of the substance of uterus. It is divided into two major portions, the body and cervix by a slight narrowing at the level of internal os. The fundus is the superior area of the body above entrance of fallopian tubes. The area of the body where the tubes enter the uterus is called cornua[37].

Uterus is located between the two layers of broad ligament laterally, bladder anteriorly and rectosigmoid colon posteriorly. Round ligaments arise from uterine cornua anterior to fallopian tubes in broad ligament, extend antero laterally coursing thro the inguinal canal to insert into the fascia of labia majora[37].

Fallopian tubes run laterally from the uterus in the upper free margin of the broad ligament. Each tube varies from 7 to 12 cms in length. Ovaries are elliptical in shape with long axis usually oriented vertically. Fimbriae of fallopian tubes lie superior and lateral to the ovary[37].

Anterior surface of ovary is attached to posterior surface of broad ligament by a short meso ovarium. Lower pole of ovary is attached to uterus by ovarian ligament. Upper pole is attached to the lateral wall of the pelvis by lateral extension of broad ligament known as suspensary ligament of ovary[37].

Cervix opens into the upper vagina through the external os. The vagina is a fibro muscular canal that lies in the midline and runs from the cervix to the vestibule of external genitalia. The cervix projects into proximal vagina creating a space between

the vaginal walls and surface of the cervix called vaginal fornix. Although the space is continuous it is divided into anterior, posterior and 2 lateral fornices[37].

Arterial supply to the uterus comes primarily from uterine artery, a major branch of anterior trunk of internal iliac artery. It ascends along the lateral margin of the uterus in broad ligament and at the level of uterine cornua runs laterally to anastomose with the ovarian artery. The uterine arteries anastomose extensively across the midline through the anterior and posterior arcuate arteries, which run within the broad ligament and then enter the myometrium. The uterine plexus of veins accompanies the arteries.

Ovarian artery supplies the ovary. It is a branch of aorta and anastomoses with uterine artery. Right ovarian vein drains into IVC. Left ovarian vein drains into left renal vein.

Lymphatic drainage of ovary is to the lateral aortic and peri aortic lymphnodes. The lymphatic of fundus, upper uterine body and fallopian tubes accompany those of ovary and of the lower uterine body to external iliac nodes. Whereas those of cervix course in three directions. Laterally to the external iliac lymphnodes, posterolaterally to the internal iliac nodes and posteriorly to lateral sacral lymphnodes. The lymphatic of upper vagina to external and internal iliac lymphnodes following uterine artery. Whereas those of mid vagina follow vaginal artery branch to internal iliac nodes. Lower vagina near the orifice joins those of vulva and drain to superficial inguinal nodes.

As stated in the introduction, 15 to 20% of the women in the reproductive age group have uterine mass lesions[37,38], Imaging plays an integral role in evaluation of

gynaecological diseases. Many studies have proved the usefulness of MRI in characterising the uterine mass lesions and thereby to make a definitive diagnosis.

Mass lesions seen commonly in uterus can be divided into

1. Lesions involving myometrium		Leiomyoma
		Adenomyosis
		Leiomyosarcoma
	Rarely	Lipoleiomyoma
		Malignant lymphoma
		Arteriovenous malformations
2. Lesions involving endometrium		Endometrial polyp
		Endometrial hyperplasia
		Endometrial carcinoma
		Endometrial cyst
		Hematometrocolpos
	Rarely	Endometrial stromal sarcoma
3. Lesions involving cervix		Nabothian cyst
		Cervical polyp
		Carcinoma cervix
	Rarely	Adenoma malignum

To correctly identify the abnormalities, normal sonographic and MRI appearance of uterus along with cut-off values of various measurements should be known.

SONOGRAPHIC APPEARANCE OF UTERUS

Uterine measurement above 8x5x4cms is considered as enlarged[37,36]. Endometrium is best measured on a midline sagittal scan of uterus and should include both anterior and posterior portions of the endometrium. Endometrial size and thickness vary with the menstrual cycle[37,36].

Endometrium consists of deep basalis and superficial functional layer. Functionalis layer undergoes changes throughout the menstrual cycle and is shed with each menses. Basal layer remains intact during the cycle and contains the spiral arteries.

Menstrual phase endometrium consists of a thin broken echogenic line. In proliferative phase endometrium thickens reaching 4 to 8mm. Endometrial cavity is seen as thin echogenic line as a result of specular reflection from the interface between the opposing surfaces of the endometrium. A relatively hypoechoic region that represents functional layer can be seen around central echogenic line which becomes more clearly defined in late proliferative phase. Hypoechoic appearance is due to orderly arrangement of glandular elements. It is surrounded by echogenic basal layer[37,36].

In secretory phase functional layer changes from hypoechoic to hyperechoic. It measures 7 to 14mm. This appearance is due to increased mucus and glycogen within the glands as well as due to increased number of interfaces caused by tortuosity of spiral arteries. Following menopause endometrium becomes atrophic and seen as thin echogenic line. It should not measure more than 8mm[37,36].

Normal myometrium consist of three layers. Intermediate layer is thickest and has uniformly homogenous structure of low to moderate echogenicity. Inner layer is thin, compact which is hypoechoic and surrounds the relatively echogenic endometrium. It

has also been referred as sub endometrial halo. Outer layer is slightly less echogenic than intermediate layer and is separated from it by arcuate vessels[37].

MRI APPEARANCE OF UTERUS

Uterus appears as uniformly low signal intensity structure on T_1 weighted images and no internal anatomy is visualized. In all pre menopausal women three distinct zones within the uterine corpus can be depicted on T_2 weighted images. A central high signal intensity stripe corresponds to the endometrium and secretions within the endometrial cavity. This is surrounded by low signal intensity band referred to as junctional zone. Histologically it corresponds to innermost layer of myometrium and has an increased nuclear area compared with outer myometrium primarily reflecting increased cellularity and decreased water content in the junctional zone in comparison with outer myometrium. The outer layer of myometrium is of intermediate signal intensity[36,31].

Endometrium varies in thickness during menstrual cycle and measure from 4mm to 13mm. Outer myometrium may vary in signal intensity and width during menstrual cycle reaching maximum width of 2.5cm in late secretory phase. The width of junctional zone averages 5mm and does not vary significantly during menstrual cycle[31].

In postmenopausal women as myometrial signal intensity is decreased, myometrial / junctional zone contrast is decreased and the junctional zone is less easily definable and may not always be present. In women taking OCP the endometrium is thin and averages 2mm and does not vary in width. The size of the uterine corpus and width of the junctional zone is decreased. Myometrial signal intensity is increased due to increased uterine water content[31].

Four distinct zones can be identified in cervix on T_2 weighted images. Central stripe of high signal intensity represents mucus within the endocervical canal. Immediately subjacent is zone of intermediate signal intensity most likely representing cervical mucosa. Mucosal folds, the plicae palmata, can often be visualised within this layer. Surrounding this layer is the band of low signal intensity contiguous with junctional zone of uterine corpus and represents fibrous cervical stroma. Outer most zone is contiguous with the outer zone of myometrium and is isointense. The MR appearance of cervical zonal anatomy does not appear to be hormonally dependent[31].

On T_1 weighted gadolinium contrast enhanced images the zonal anatomy is variable and depends on timing after injection and the hormonal status of the patients.

MASS LESIONS; LEIOMYOMA:

Leiomyoma are the most common uterine neoplasm and are composed of smooth muscle with varying amounts of fibrous connective tissue[37,36]. Most leiomyomas are asymptomatic. Patient may present with abnormal uterine bleeding, pain, infertility, palpable abdominopelvic mass and symptoms due to pressure on adjacent organs.

Leiomyomas are classified depending on the location in the corpus as submucosal (projecting into the uterine cavity), intramural (confined to the myometrium) and subserosal (projecting from the peritoneal surface of the uterus). Submucosal fibroids, although less common, produce symptoms most frequently. 8% can occur in the cervix[37].

The size and the number of leiomyomas are variable. Although little is known about the factors responsible for the initial neoplastic transformation, it is hypothesised that each leiomyoma arise from a single cell in myometrium. Several observations suggest that oestrogen and progesterone play an important role in growth of leiomyoma.

As leiomyoma enlarge, they may outgrow their blood supply, resulting in various types of degenerations namely hyaline, myxoid, calcific, cystic and red degeneration

Leiomyomas present with variable appearances in sonography[37].They are

1. Globular enlargement of uterus with heterogenous echotexture due to small diffuse leiomyomas.
2. Localized leiomyomas are hypoechoic or heterogenous echotexture with contour irregularity.
3. May have areas of acoustic attenuation or shadowing due to dense fibrosis within the tumour.
4. Calcification appears as focal areas of increased echogenicity with shadowing or as a curvilinear echogenic rim in periphery.
5. Cystic degeneration and necrosis occur centrally and produce areas of decreased echogenicity.

Transvaginal ultrasound is used for better delineation of small fibroids, submucosal fibroids and showing the uterine origin of pedunculated fibroids. Leiomyomas in the fundus of the retroverted uterus are much better delineated by transvaginal sonography.

Schwartz LB, Zawin M, Carcangiu ML, Lange R, McCarthy S, etal[6] study on 'Does pelvic MRI differentiate among the histologic subtypes of uterine leiomyomata?', states MRI has 95% sensitivity and 72% specificity for diagnosing an uncomplicated leiomyoma, 10% sensitivity and 100% specificity for a cellular leiomyoma, 80% sensitivity and 98% specificity for cystic leiomyomata and 100% sensitivity and 86% specificity for a haemorrhagic leiomyomata

Weinreb JC, Barkoff ND, Megibow A, Demopoulos R etal[4] studied the value of MR imaging in distinguishing leiomyomas from other solid pelvic masses when sonogrphy is indeterminate and concluded that as leiomyomas often have characteristic MR appearance which will help to differentiate from other pelvic masses, MRI is useful diagnostic tool in deciding on sonographically indeterminate masses.

Togashik, Ozasa H, Konishi I, Itoh H, Nishimura K, Fujisawa J, Noma S, Sagoh T, Minami S, Yamashita K etal[7] studied 93 patients with enlarged uterus in differentiating between adenomyosis and leiomyoma with MR imaging and concluded that MR imaging is highly accurate.

Study done by **Murase E etal**[18] and associate on histopathological features, MR imaging findings, differential diagnosis and treatment of uterine leiomyomas, observed that on T_2 weighted images non degenerated leiomyoma appear as well circumscribed masses of decreased signal intensity (SI). However cellular leiomyomas can have relatively higher SI on T_2 weighted images and demonstrate enhancement on contrast images. Degenerated leiomyomas have variable appearance on T_2 weighted images and contrast enhanced images. The differential diagnosis of leiomyoma includes adenomyosis, solid adnexal mass, focal myometrial contraction and uterine leiomyosarcoma.

Another study done by **Hricak H etal**[17] and associates on uterine leiomyomas correlation of MR, histopathological findings and symptoms states hyaline, myxomatous, fatty degenerations are seen in MRI as various degrees of inhomogenicity. This is better seen in long TR, TE sequences. It was concluded that

MR is an accurate modality for imaging uterine leiomyomas since it clearly demonstrates tumour number, size, location and the presence and extent of degeneration.

Kim JC, Kim SS and Park JY etal[20] studied the 'Bridging vascular sign' in the MR diagnosis of exophytic uterine leiomyoma in 26 patients. It is defined as presence of curvilinear tortuous signal void vascular structures crossing between the uterus and pelvic mass. Only exophytic uterine leiomyoma has this sign. So they concluded bridging vascular sign on MRI may be a useful radiological sign in the diagnosis and differentiation of an exophytic uterine leiomyoma from other masses arising in the adnexa.

Kawakami S, Togashi K, Konishi J, Kimura I, Fukuoka M, Mori T, Konishi etal[21] retrospectively studied the MR features useful in diagnosing red degeneration of uterine leiomyoma. It shows hyperintense rim on T_1 weighted images and hypointense rim on T_2 weighted images. These findings correspond to numerous dilated vessels filled with red blood cells at periphery of the lesion. The signal characteristics of the rim are best explained as an effect of abundant intracellular methaemoglobin in these vessels. They concluded recognition of these characteristics may help the radiologist to differentiate symptomatic red degeneration from other clinical conditions that need surgical intervention.

Some leiomyoma have a high signal intensity rim on T_2 weighted images, which represents a pseudo capsule of dilated lymphatic vessels, dilated veins or oedema. These histologic findings shown to correspond to peritumoral rim enhancement in contrast enhanced images.

Burn PR etal[52] and associates studied uterine fibroleiomyoma: MR imaging appearances before and after embolisation of uterine arteries. MRI done before and at 2 and 6 months of the embolisation of the uterine arteries. Signal intensity of leiomyoma was compared to skeletal muscle. Volume and enhancement characteristics were assessed. Their results showed reduction in volume was 43% at 2 months, 59% at 6 months. Before embolisation high Signal intensity on T_1 weighted images was predictive of poor response. High Signal intensity on T_2 was predictive of a good response. The degree of gadolinium enhancement was not correlated in fibroleiomyoma volume reduction. Concluded that MRI characteristic of fibroleiomyomas before embolisation can help predict subsequent response to treatment.

Oguchi O etal[54] and associates studied the correlation between T_2 characteristics and effect of GnRH analogue therapy. They observed with increasing Signal intensity, leiomyoma show increased cellularity and proliferative activity and show more reduction in size with GnRH treatment.

ADENOMYOSIS

Adenomyosis is characterised by presence of ectopic endometrial glands and stroma within the myometrium, which are associated with reactive hypertrophy of surrounding myometrial smooth muscles[36,37].

Adenomyosis most likely results from direct invasion of the myometrium by basal endometrium. They are resistant to hormonal stimulation and do not undergo the full cyclic changes of normal functional endometrium. In contrast in endometriosis the glands undergo the same cyclic change as the normal endometrium. Adenomyosis is

most commonly a diffuse abnormality but may also occur as a focal mass which is known as an adenomyoma. The clinical presentation may include dysmenorrhoea and menorrhagia a presentation similar to that of uterine leiomyoma. It affects premenopausal multiparous women over the age of 30 years[36,37,38].

Transabdominal sonographically the diagnosis has been considered to be difficult[37]. It can be suggested if there is diffuse uterine enlargement with normal contour, thickening of posterior myometrium and tiny necrotic area in myometrium.

Transvaginal sonography is more accurate in diagnosing this condition than transabdominal ultrasound. The criteria are[37]

1. Inhomogenous hypoechoic areas within the myometrium having indistinct margins.
2. Small myometrial cyst representing dilated glands in ectopic endometrial tissue.
3. Localized adenomyoma appear as inhomogenous circumscribed areas in myometrium having indistinct margins and containing anechoic lacunae.

Reinhold C, Atri M, Mehio A, Zakarian R, Aldis AE, Bret PM etal[11] studied morphologic criteria and diagnostic accuracy of endovaginal sonography in diffuse uterine adenomyosis. Criteria are poorly defined area of abnormal echotexture (Increased or decreased echogenicity, heterogenous echotexture, myometrial cyst). Results show sensitivity of 86% and specificity of 86%. They concluded that adenomyosis of uterus could be accurately diagnosed with endovaginal ultrasound with specific sonographic criteria.

Byun JY, kim SE, Choi BG, Ko GY, Jung SE, Choi KH etal[5] evaluated the MRI imaging finding in diffuse and focal adenomyosis in 45 patients. Characteristic of diffuse

adenomyosis is diffuse thickening of endometrial - myometrial junctional zone (7 to 37 mm, mean 16 mm) with homogenous low signal intensity in T2 weighted sequence. High signal intensity foci can be seen in T1/T2 weighted sequences or in both.

Characteristic of focal adenomyoma is localized low SI round or oval mass with diameter of 2-7 cm with ill defined margins with high signal intensity foci either in T_2 weighted sequences or in both T_1 and T_2 weighted sequences. They concluded that MRI is useful in differentiating adenomyosis from uterine myoma and planning appropriate treatment.

T_2 weighted imaging provides significantly better lesion detection than unenhanced or contrast enhanced T_1weighted images. The thickness of normal junctional zone changes during the menstrual cycle whereas the thickness of diffuse adenomyosis remains unchanged.

High signal intensity foci within the low signal intensity lesion in T_2 weighted images only represent endometrial tissue or cyst. High signal intensity in both T_1 and T_2 weighted images correspond to the haemorrhage within the endometrial islands. Identification of punctate high signal intensity foci adds specificity to the diagnosis of adenomyosis. It is seen in 40% cases of diffuse adenomyosis and 100% cases of focal adenomyosis[5].

Ascher SM, Arnold LL, Patt RH, Schruefer JJ, Bagley AS, Semelka RC, Zeman RK, Simon JA etal[12] prospectively compared MRI with Transvaginal ultrasound in detection of adenomyosis in 20 women and concluded that MRI is significantly better ($P \leq 0.02$) than Transvaginal ultrasound.

Sugi mura K, Okizuka H, Imaoka I, Kaji Y, Takahashik, Kitao M, Ishida T etal[16] in their study of pelvic endometriosis detection and diagnosis with chemical shift MR imaging in 35 women with clinical diagnosis of endometriosis observed that Fatsaturation T_1 weighted imaging in combination with conventional technique accurately demonstrated the lesions.

The distinction between adenomyosis and leiomyoma is of clinical importance because unlike leiomyomas which may be treated with myomectomy, adenomyosis can be extirpated only with hysterectomy. The importance of accurately diagnosing adenomyosis preoperatively has been stressed in many articles[5].

ENDOMETRIAL POLYP

Endometrial polyps are benign nodular protrusions of the endometrial surface that consist of irregularly distributed endometrial glands and stroma. They generally consist of three components.

1. Stroma of focally or diffusely dense fibrous or smooth muscle tissue
2. Thick walled vessels
3. Endometrial glands

Cystic glandular hyperplasia within the polyp occurs most commonly. **Ralf P etal**[22] and associates in their study concluded central fibrous core (Low signal intensity in T_2 weighted images) and intratumoral cysts (High signal intensity on T_2 weighted images) were seen most frequently in endometrial polyps than in carcinomas. Myometrial invasion and necrosis showed high predictive value for carcinomas. Accuracy does not appear to be sufficient to obviate biopsy, partly because carcinoma and polyps frequently co-exist.

On ultrasound, polyp is seen as focal thickening of endometrium. On hysterosonosalphingography polyp is seen as homogenously echogenic lesion with narrow base of attachment. It is better seen because of the surrounding fluid in the endometrial cavity. Well defined vascular pedicle can be seen with colour Doppler. Cystic areas may be seen within the polyp representing histologically dilated glands.

ENDOMETRIAL CARCINOMA

Endometrial carcinoma is the most common gynaecological malignancy in the western world. 75 to 80% occur in postmenopausal women. 80% of the cases are diagnosed in the early stages as they present with spotting[37].

Lee EJ, Byun JY, Kim BS, Koong SG, Shinn KS etal[8] studied the usefulness of T_2 weighted and gadolinium enhanced T_1 weighted sequences in staging early endometrial carcinoma and concluded that T_2 weighted imaging was more accurate in premenopausal patients and gadolinium enhanced T_1weighted imaging was more accurate in post menopausal patients.

Manfredi R, Mirk P, Maresca G, Margarite PA, Testa A, Zannoni GF, Giordano D, **Scambia G, Marano P etal**[9] studied 37 patients with endometrial carcinoma for local regional staging of endometrial carcinoma with MRI and concluded MRI coupled with contrast material enhanced dynamic MR imaging is highly accurate in local regional staging of endometrial carcinoma. More challenging is the assessment of pelvic and lumbo aortic lymphnodes.

Utsunomiya D, Notsute S, Hayashida Y, Lawakatase F, Katabuchi H, Okamura H, **Awai K, Yamashita Y etal**[10] studied endometrial carcinoma in adenomyosis of 11

patients and concluded dynamic contrast T_1 weighted imaging improves accuracy of staging by delineating superficial and deep myometrial invasion.

Staging of endometrial carcinoma – FIGO

Stage 0 - Imaging not applicable

Stage 1 - Tumour confined to the uterine corpus.

1a - Confined to endometrium.

1b - Invasion to inner half of myometrium.

1c - Outer half of myometrium

Stage 2 - Tumour extends into cervix

2a - Cervical stroma not involved. Only glandular involvement

2b - Cervical stroma invaded.

Stage 3a - Invades serosa / adnexa / positive peritoneal cytology

3b - Vaginal metastasis

3c - Metastasis to the pelvic or para aortic lymphnodes

Stage 4a - Invades bladder, bowel mucosa or both

4b - Distant metastasis including intra abdominal and inguinal lymphnodes.

Tsuada H etal[24] in his comparative study of myometrial invasion detection by MRI and intrauterine ultrasound concluded that accuracy of both is 85%. This is because in two cases intrauterine ultrasound was able to demonstrate superficial myometrial invasion that could not be diagnosed by MRI. In contrast, intrauterine ultrasound was unable to diagnose myometrial invasion in two cases in which MRI could diagnose it.

Veda M etal[25] and associates retrospectively analysed 8 cases of endometrial stromal sarcoma for MR characteristics and concluded irregular margin, nodular lesion at the margin, intra myometrial nodular extension and multiple nodular formation were more frequently seen in cases of endometrial stromal sarcoma than in cases of endometrial carcinoma. MRI plays a role in diagnosing as well as in differentiating endometrial stromal sarcoma from endometrial carcinoma.

Hricak H etal[26] and associates study on MR evaluation of endometrial carcinoma results of an NCI Cooperative study states that overall accuracy with MR imaging for staging endometrial carcinoma was 85% MR is more useful in detection of myometrial invasion. Intact junctional zone implies stage 1a. An irregular interface between endometrium and myometrial junctional zone or involvement of junctional zone is stage 1b. More than 50% myometrial involvement is 1c.

Tang X etal[51] and associates study on Endometrial – Myometrium ratio, a newly proposed diagnostic parameter on MRI assessment of myometrial invasion by endometrial carcinoma, defines that the myometrial invasion is present if the Endometrial Myometrial ratio is >1 and it is limited to Endometrium for values <1.

Brown JJ, Thurnher S, Hercak H etal[29] in their retrospective study on MR Imaging of the uterus: low signal intensity abnormalities of endometrium and endometrial cavity, classified the causes of low signal intensity as submucosal leiomyoma, blood clot, endometrial carcinoma, early intrauterine pregnancy, retained products of conception and endometrial hamartoma. Correct diagnosis was made only in 9 of the 11 submucosal leiomyomas. MR findings were non specific in remainder of

cases. Final conclusion was correlation with clinical history is essential and a specific diagnosis is not possible.

NABOTHIAN CYST CERVIX

Nabothian cysts are deep seated retention cysts of cervical glands which may cause only minor surface irregularity. Infection is a classic feature in the history of such patients. Histologically it is an aggregation of cystic clefts, but the individual epithelial cells are benign. The process is probably the result of occlusion of many channels by a non inflammatory, non neoplastic process[36,37].

It is seen in ultrasound as tiny anechoic lesion with posterior acoustic enhancement. In MRI it is seen as hyper intense cysts in T_2 weighted images.

Li H, Sugimura K, Okizuka H, Yoshida M, Maruyama R, Takahashi K, Miyazaki K etal[15] studied marked high signal intensity lesions in uterine cervix on T_2 weighted imaging differentiation between mucin producing carcinoma and nabothian cysts as both will show high signal in T_2 weighted images. Malignancy to be considered in gadolinium enhanced T_1 weighted images if there is 1. an enhanced lesion, 2. an irregular margin, 3. iso intensity on T_1weighted images. In contrast, high signal intensity in T_1 is considered benign. So gadolinium enhanced T_1 weighted imaging improves the specificity.

CARCINOMA CERVIX:

Carcinoma cervix is the commonest genital malignancy of women in India. Second most common gynaecological malignancy in women in United States. Cervical intra epithelial neoplasia is considered a precursor lesion of cervical cancer. Carcinoma arises at squamocolumnar junction. In young women it grows predominantly exophytic

and large parts of the tumour extends inferiorly into the vagina. In older women with atrophic cervices the squamo columnar junction is located in endocervical canal. It involves supra vaginal portion of cervix and frequently extends laterally through cervical wall. Two main histological types can be differentiated. 1. squamous cell carcinoma and 2. adenocarcinoma which carries worst prognosis.

FIGO staging cervical carcinoma

Stage	I	-	Limited to Uterus
	IA	-	Pre clinical invasive carcinoma
	IA_1	-	Depth $\leq$ 3mm, horizontal spread $\leq$ 7mm
	IA_2	-	Depth 3 to 5 mm, horizontal spread $\leq$ 7mm
	1B	-	Tumor greater than $1A_2$
Stage	II	-	Beyond uterus but not to pelvic sidewall or lower third of vagina
	IIA	-	No parametrial invasion.
	IIB	-	With parametrial invasion
Stage	III	-	Extends to pelvic wall / involves lower third of vagina / hydronephrosis
	IIIA	-	Lower third of vagina involved, not to pelvic sidewall
	IIIB	-	Pelvic side wall / hydronephrosis
Stage IV	A	-	Tumour invades bladder mucosa or rectum /extends beyond true pelvis
	IVB	-	Distant metastasis including lymph nodes beyond true pelvis

On ultrasound, carcinoma cervix is seen as solid irregular mass in the cervix. It can be associated with haematometra or pyometra. On MRI, cervical carcinoma appears as high signal intensity lesion than cervical stroma in T_2 weighted images because it has longer T_2 values than stroma.

Chung JJ, Kim MJ, Cho NH, Park S, Lee JT, Yoo HS etal[13] compared the T_2 weighted fast spin echo MR findings of adenocarcinoma of uterine cervix with squamous cell carcinoma and concluded that in T_2 FSE the signal intensity ratio of tumour more than 3 can be considered as adenocarcinoma. That is signal intensity of adenocarcinoma is higher than that of squamous cell carcinoma because multiple tumorous glands with cytoplasmic and intraglandular mucin / serous fluid were pathologically found in adeno carcinoma. But squamous cell carcinoma revealed compact cellularity of stratified squamous tumour cells.

Hricak H, Lacey CG, Sandles LG, Chang YC, Winkler ML, Stern JZ etal[14] studied invasive cervical carcinoma comparison of MR imaging and surgical findings and concluded that the overall accuracy of MR imaging in staging was 81%. MR imaging is valuable because it can accurately demonstrate tumour location, tumour size, degree of stromal penetration and lower uterine segment involvement and ruling out parametrial pelvic sidewall, bladder and rectal involvement.

Kims H, Han MC etal[53] in their study on invasion of urinary bladder by cancer cervix evaluation with MRI considered the following findings as suggestive of vesical invasion. They were 1) Nodularity and irregularity of bladder wall, 2) masses protruding into bladder lumen, 3) High Signal intensity of anterior aspect of posterior wall of the bladder and 4) Abnormal soft tissue strands in the uterovesical space.

To identify all the above lesions in our institution we use T_1 weighted FSE sagittal, T_2weighted FSE in two planes (sagittal, either oblique coronal or oblique axial),Contrast enhanced T_1 weighted images for staging malignant lesions, chemical shift imaging in cases of haemorrhagic cysts & dermoid ovary &optional sequence of GRE & Fat sat T_2 in cases of haematometrocolpos. This is emphasized by the following studies.

Asher SM, O'malley J, Semelka RC, Patt RH, Rajan S, Thomasson D, etal[1] compared FSE sequence with BHFSE in 32 women for imaging characteristics like quality, anatomy definition, lesion detection, free fluid detection and concluded that all pathology detected with T_2 FSE was detected on BH T_2 FSE despite the inherently poor spatial resolution of BH sequences compared with the non BH sequences.

Thurnher SA etal[2] studied the value of contrast enhanced MR images with that of T_2 weighted MR images in the diagnosis and staging of pelvic masses in women and concluded sensitivity of contrast enhanced MR images was 96%, equal to that of unenhanced T_2 weighted images 97% in depiction of pelvic lesions. It is helpful in detecting parametrial invasion if T_2 images are equivocal in cancer cervix and overall staging accuracy on contrast enhanced imaging was 80%. It was inferior to that of T_2 weighted imaging in which the staging accuracy was 83%. Administration of contrast was not helpful in evaluation of subserous myoma. He has also emphasised that contrast enhanced MR can be used as complementary sequence to T_2 weighted sequence

1. To predict malignancy in adnexal tumours
2. To stage endometrial carcinoma.
3. To determine tumour extension in cancer cervix.

Hricak H, Finck S, Honda G, Gorahson H etal[3] studied the value of gadopentate dimeglumine enhanced T_1 weighted images in evaluation of benign uterine masses and concluded with conventional spinecho sequences the use of contrast enhanced T_1 weighted images does not improve the detection or characterisation of uterine leiomyomas or adenomyosis, but significantly improves the detection of endometrial polyps.

MATERIALS AND METHODS

A prospective study of 52 patients with suspected uterine masses referred from Institute of Obstetrics and Gynaecology department, Egmore was done in Barnard Institute of Radiology, Madras Medical College from July 2004 to August 2005.

All patients were subjected to Transabdominal Ultrasound, Transvaginal Ultrasound and MRI examination. Then depending upon the final diagnosis they underwent endometrial curettage, cervical biopsy, myomectomy or hysterectomy. Final histopathological report was taken as gold standard to compare the findings and the final diagnosis of each imaging modality.

Grey scale Transabdominal and Transvaginal Ultrasound were performed using a 3500 series Aloka unit; equipped with 3.5 mega hertz convex probe and 5.0 mega hertz Transvaginal probe. MRI was performed using Siemens 1.5 tesla superconducting Magnetome using CP spine array coil.

METHOD

A preliminary abdominal examination, per speculum and per vaginal examination was done. Transabdominal Ultrasound was done in full bladder with optimal settings, then bladder emptied and Transvaginal Ultrasound done. In both the Ultrasound examinations the following uterine parameters were noted: the size of the uterus, contour – regular/ lobulated, endometrium – homogenous / inhomogenous, echogenic / hypoechoic comparing to the myometrium, endometrial thickness – measured from

myometrial – endometrial junction (outer echogenic layer) to the opposite myoendometrial junction.

Presence or absence of endometrial cavity fluid, any mass lesion within the endometrium, if mass present single or multiple and its characteristics were noted.

In the myometrium homogenous/ inhomogenous echotexture, anterior and posterior wall symmetry/asymmetry, presence of any myoma, if so location like submucous, intramural and subserosal, number of lesions, echogenicity of the lesions, areas of calcification, cystic change within the lesion and shadowing were noted.

Presence of any cyst within the myometrium, if so single or multiple and location like anterior or posterior myometrium were noted.

Is the lesion causing indentation on the bladder wall, whether the cervix is normal or abnormal, if abnormal is there nabothian cyst, polyps, mass, if mass the extension of the mass and associated any endometrial collection were seen.

Bilateral adnexa to visualize ovary whether normal or abnormal, if so any mass or cystic lesions were also noted. Other routine screening of abdominal organs was done and any positive findings were noted for presence of hydronephrosis, ascites and lymphadenopathy.

MRI PELVIS

Patient was placed in supine position in MR gantry.

Technique used

A scout coronal section was obtained to plan for sagittal views. Oblique coronal and oblique axial sections were planned using sagittal slices (along the axis of uterus and perpendicular to it) .

The sequences used were

a. T_1 weighted sagittal

TR 700ms	TE 10ms
Number of slices 22	Slice thickness 4mm
FOV 300	Matrix size 256x256

b. T_2 weighted sagittal, coronal and axial

TR 3250ms	TE 97 ms
Number of slices 22	Slice thickness 4mm
FOV 300	Matrix size 256x256

Optional Sequences

Fat Saturation in cases of Endometriosis and Ovarian dermoid

MRI EVALUATION

In addition to the findings noted in the Ultrasonogram, in MRI the maximal junctional zone thickness was measured and junctional zone to myometrial thickness ratio calculated. For this, single layer of junctional zone is measured at the level of maximum thickness and the myometrial thickness is measured at the same level.

Intensity of the lesions in both T_1 and T_2 weighted images were noted. Number and location of the lesions were also noted. In case of endometrial lesions, level of myometrial invasion and in cases of Carcinoma Cervix, extent of the lesions was noted.

INCLUSION CRITERIA

All patients referred from Institute of Obstetrics and Gynaecology, Egmore suspected to have uterine mass lesions willing to undergo all three tests and willing for surgery were included in the study.

EXCLUSION CRITERIA

Patients who did not undergo all three tests.

Not operated or non availability of the histopathological examination report.

Patient with MR incompatible devices or implants.

Patients with Claustrophobia.

This study confines to the ethics and was done with the consent and full co-operation of the patient.

FIG 1.SAGITTAL PLAN

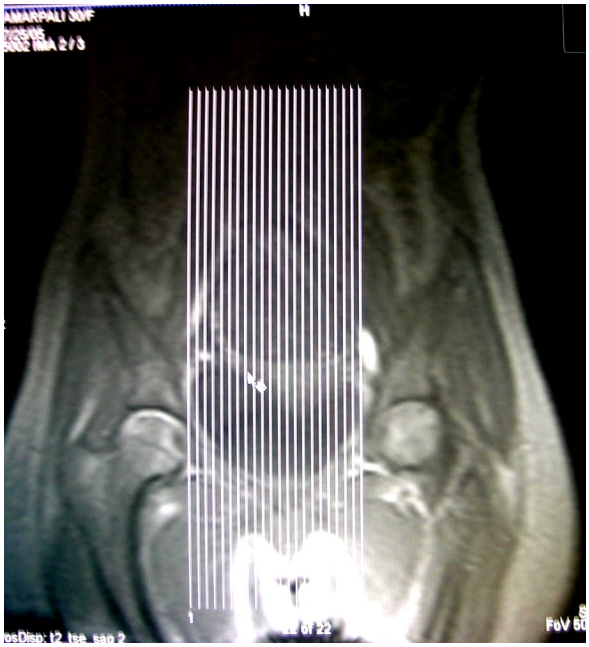
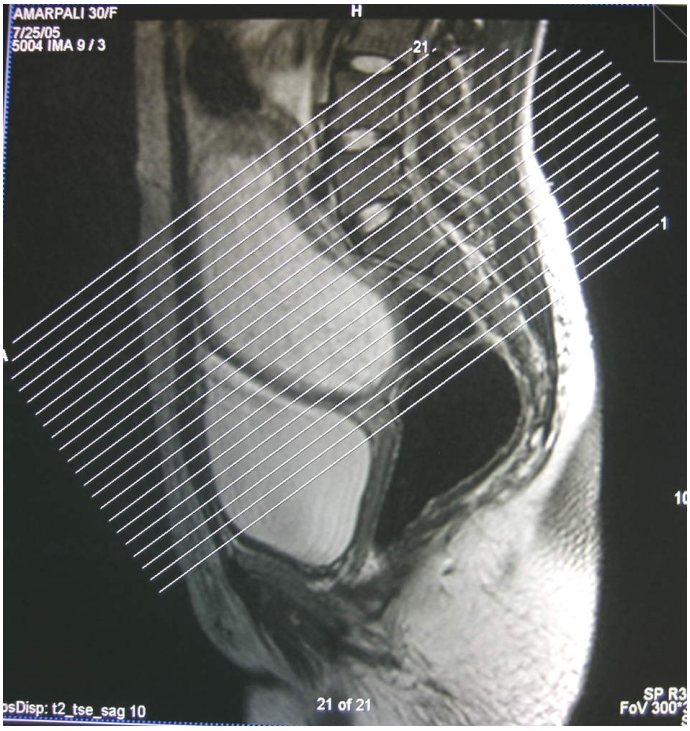


FIG 2.OBLIQUE CORONAL PLAN

FIG3. OBLIQUE AXIAL PLAN



MULTIPLE FIBROID UTERUS

FIG4 .USG

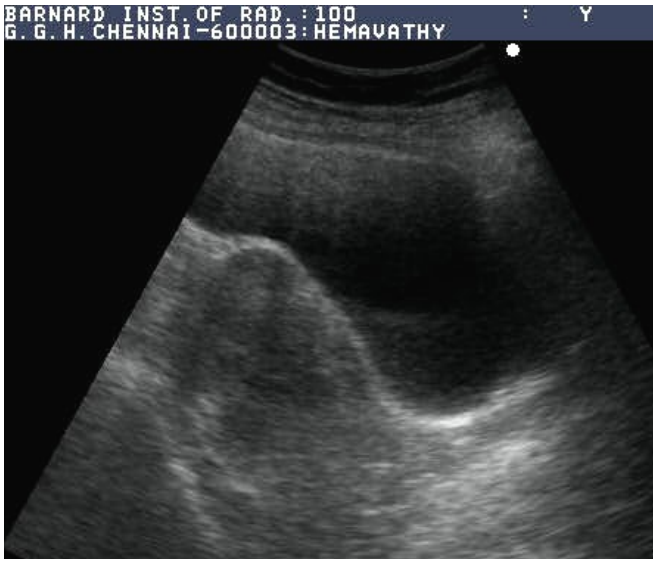


FIG 5. TV USG

FIG 6.SAG

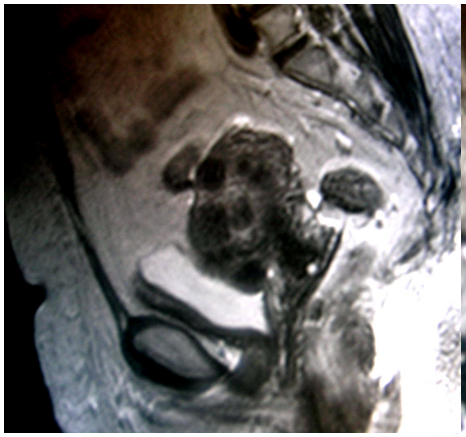


FIG7. CORONAL T_2

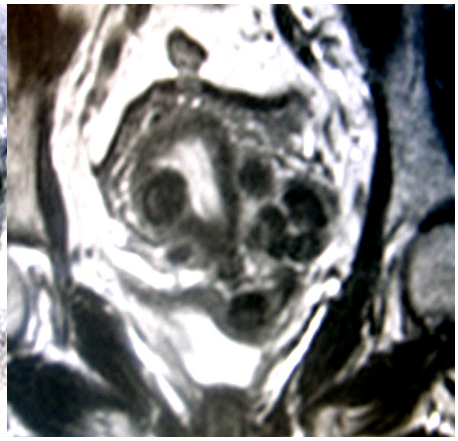
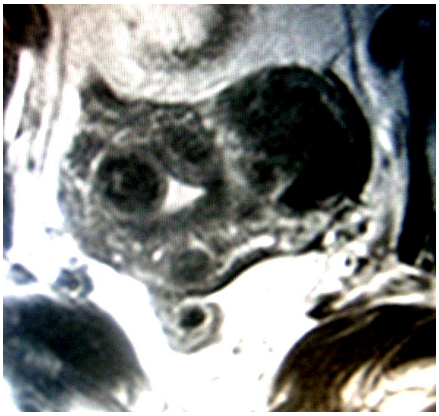


FIG8. AXIAL



ADENOMYOSIS

FIG 9.USG

FIG 10.TV USG

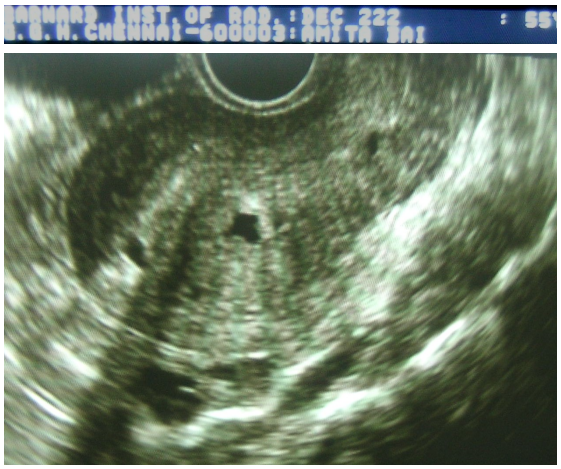


FIG 11.T_1SAG

FIG 12.AXIAL T_2

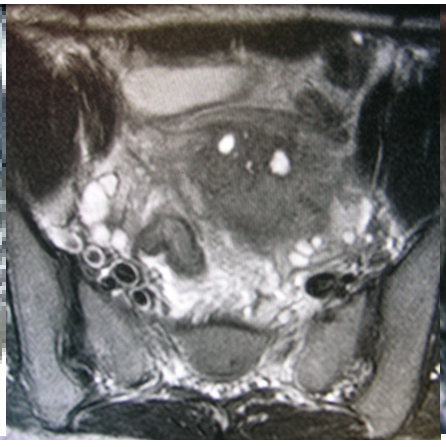
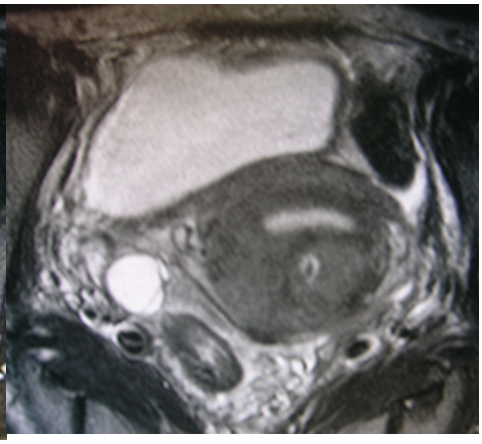


FIG 13.AXIAL T_2



CALCIFIED FIBROID UTERUS

FIG 14. USG

FIG 15. TV USG

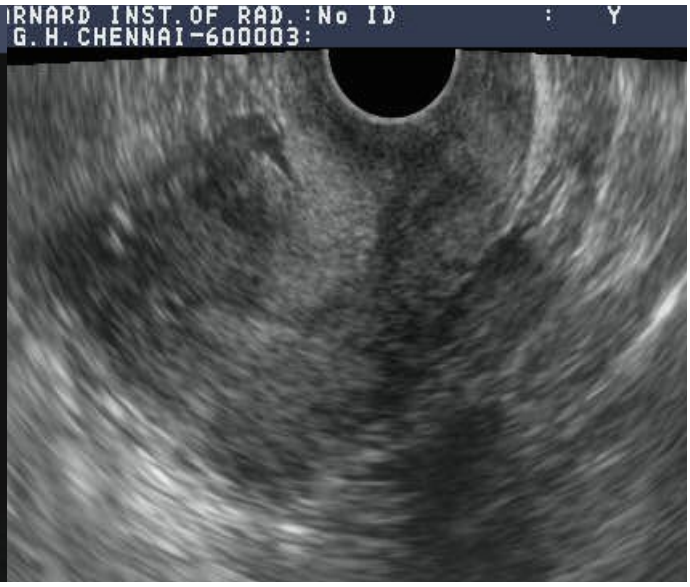


FIG 16. T_1 SAG

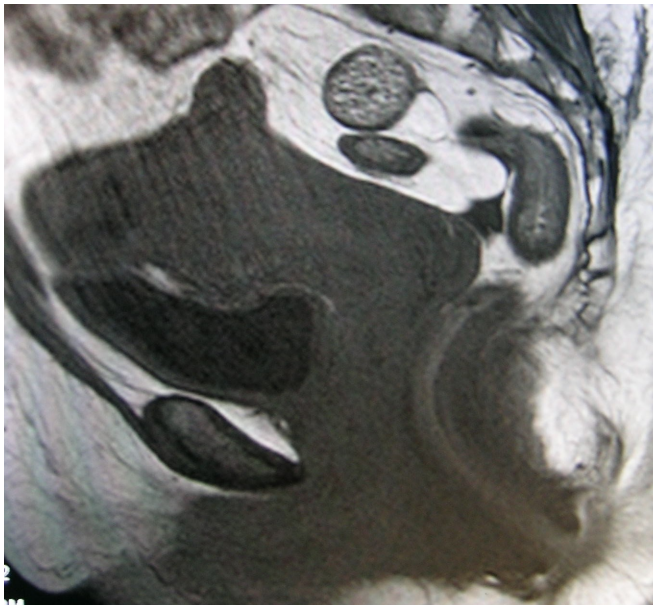
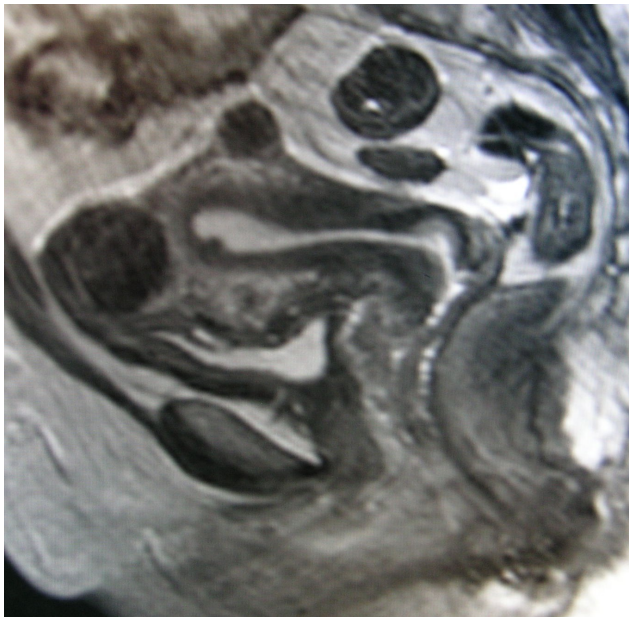


FIG 17. T_2 SAG



ENDOMETRIAL CARCINOMA WITH ENDOMETRIAL POLYP

FIG 18.USG

FIG 19. TV USG

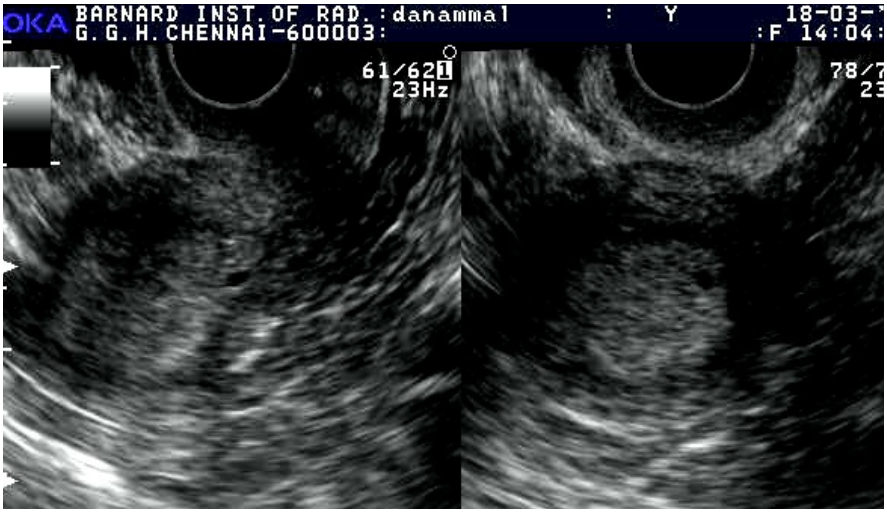


FIG 20.AXIAL

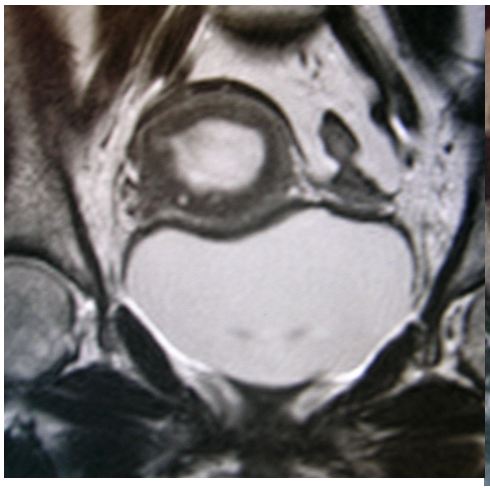


FIG 21.AXIAL

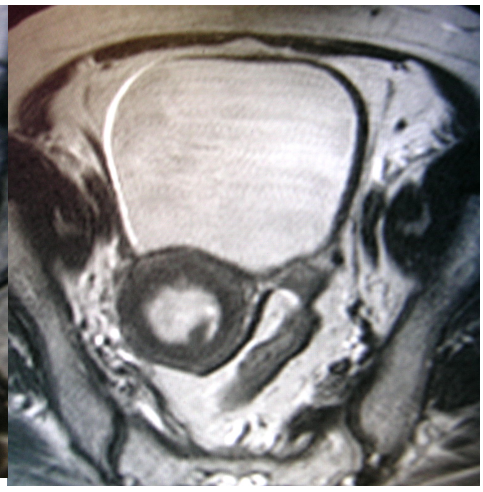
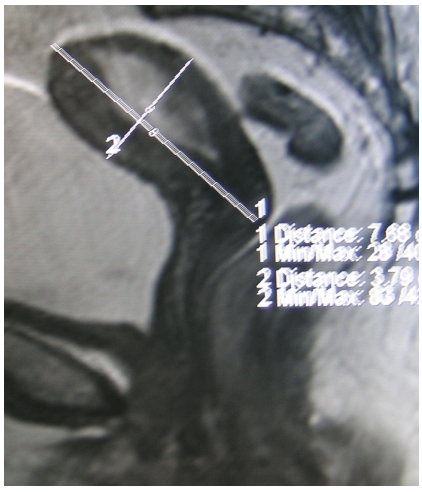


FIG 22.SAG



CARCINOMA CERVIX STAGE II B

FIG 23.USG

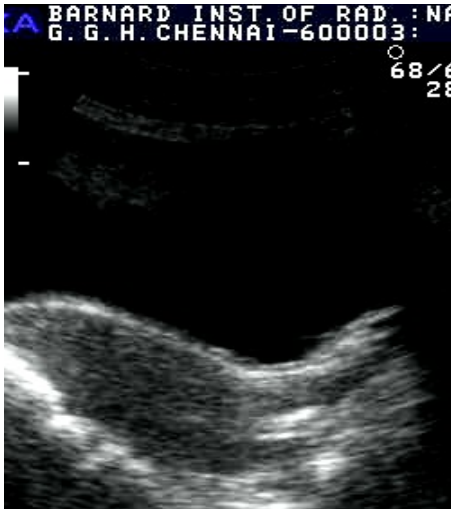


FIG 24.TV USG

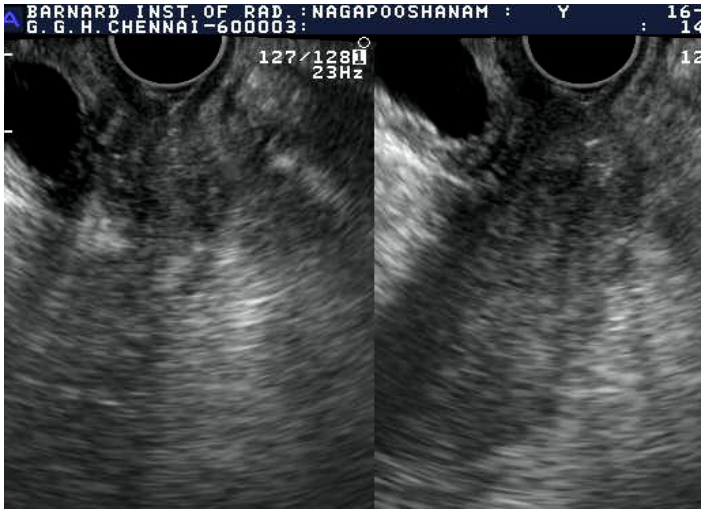


FIG 25.CORONAL

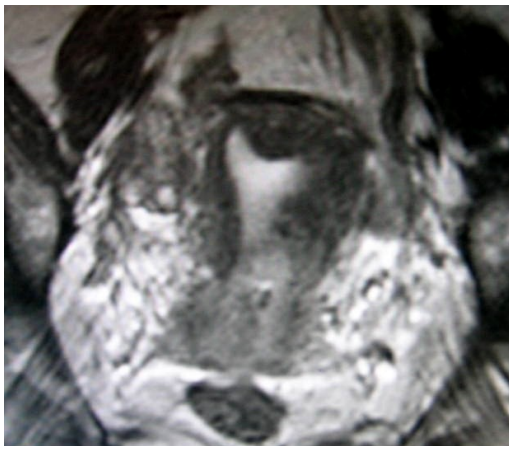


FIG 26.AXIAL

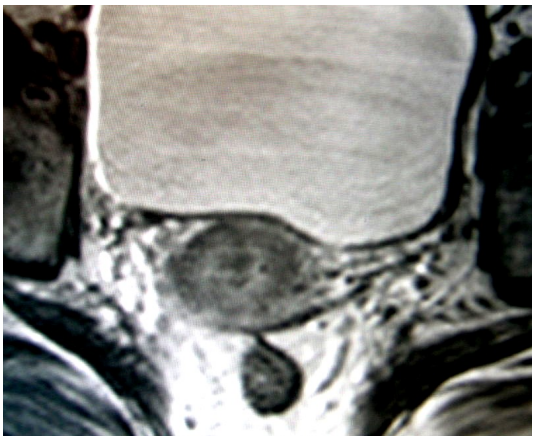


FIG 27.SAG T_2

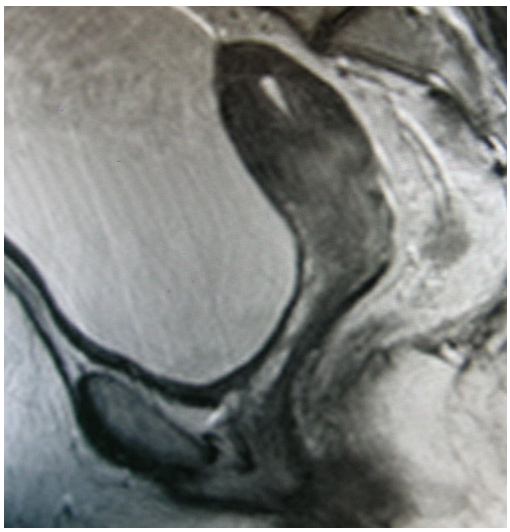
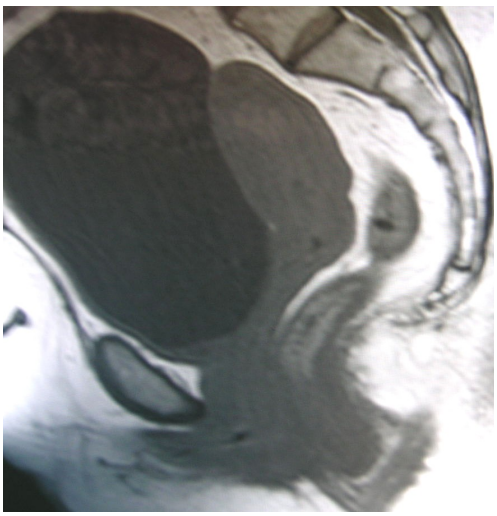


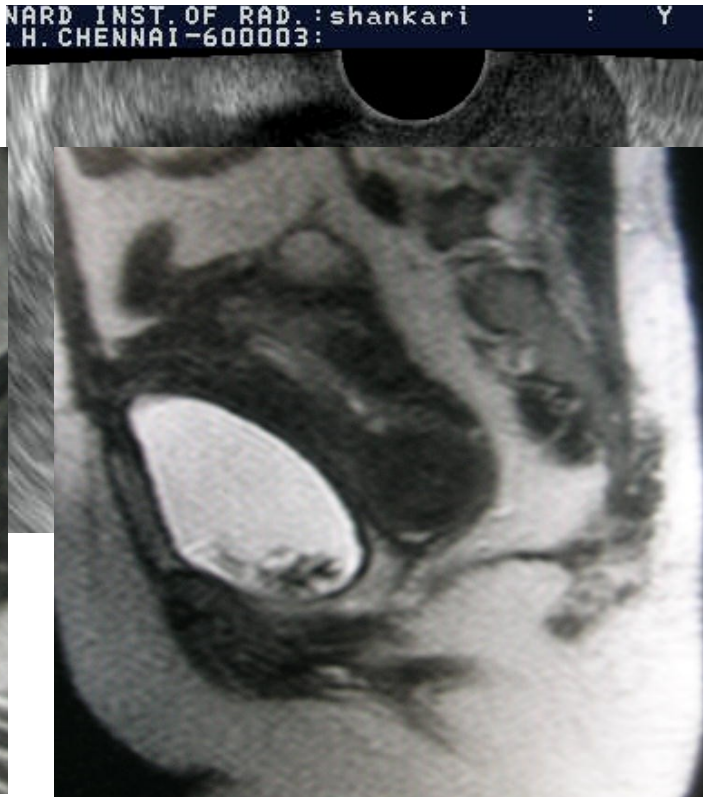
FIG 28.SAG T_1



PROLAPSING FUNDAL FIBROID

FIG 29. USG

FIG 30. TV USG



CERVICAL POLYP

FIG 33.USG

FIG 34. TV USG

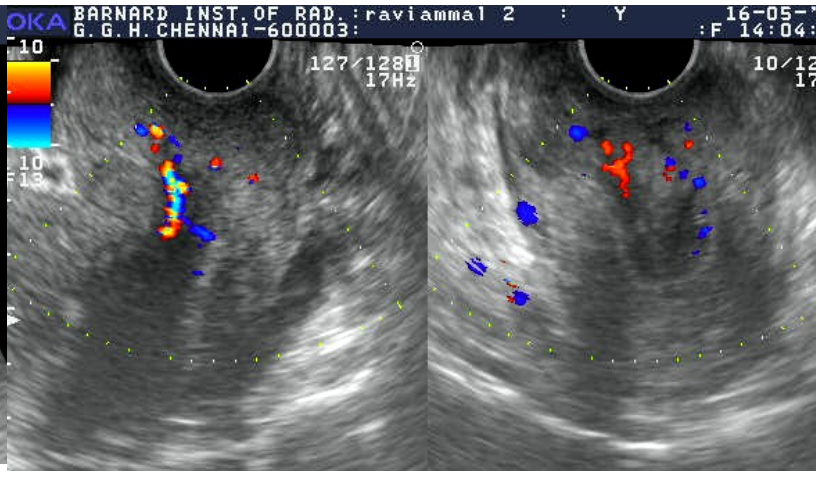
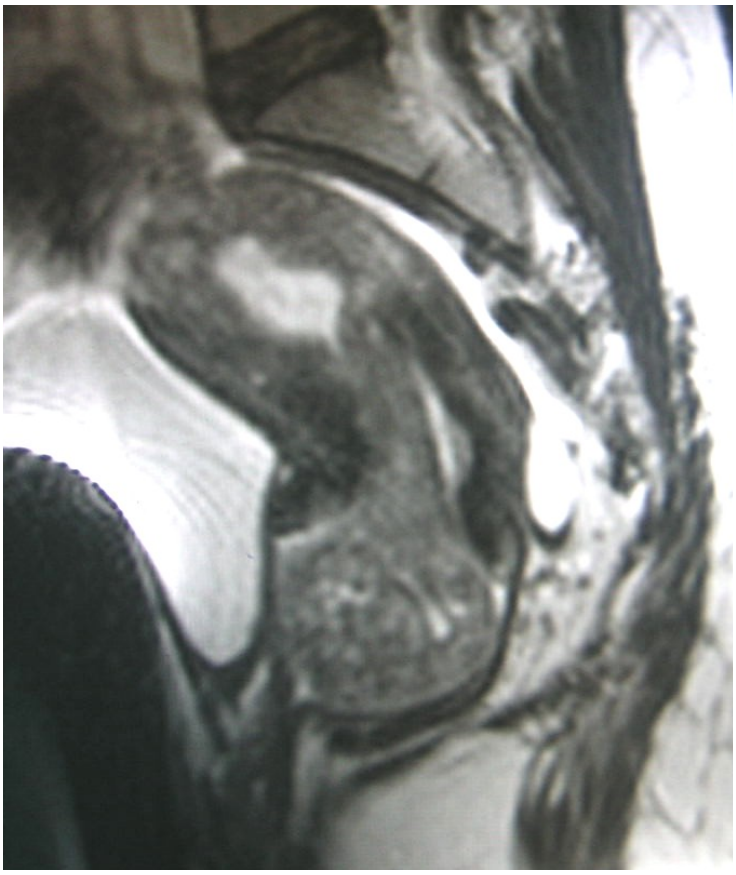


FIG 35.SAG T_2



CA CERVIX –HAEMATOMETROCOLPOSE & HAEMATO SALPHINX

FIG 36.TV USG

FIG 37. T_1SAG

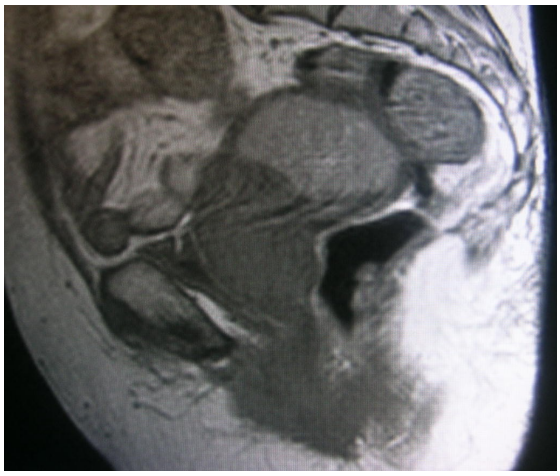


FIG 38.FATSAT T_2

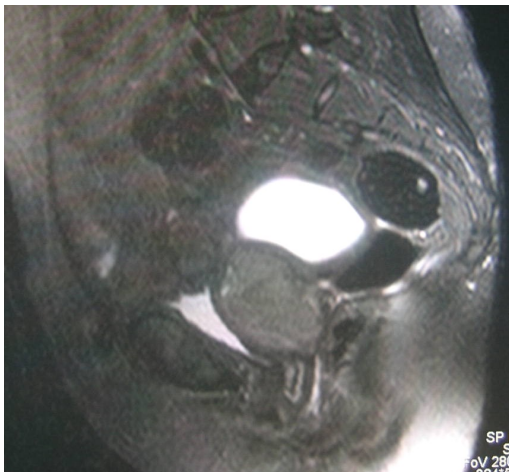


FIG 39.T_2CORONAL

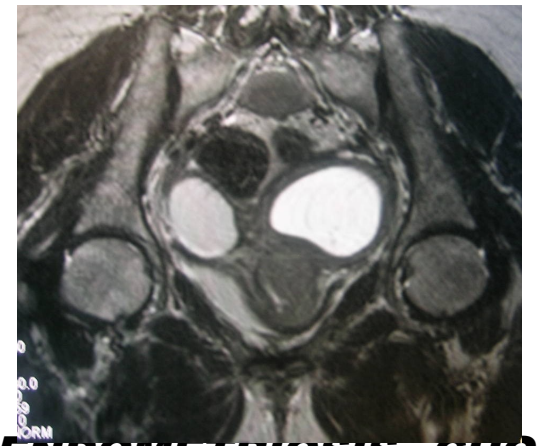
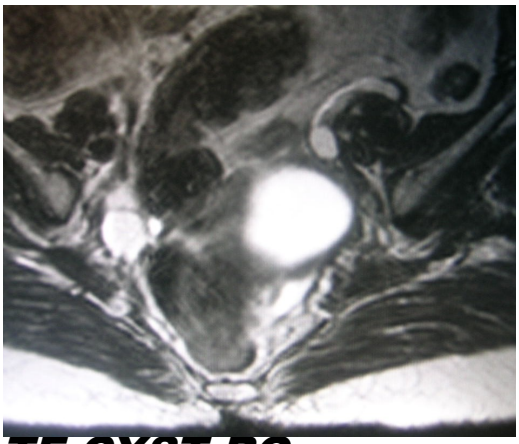


FIG 40.T_2 AXIAL



ENDOMETRIOSIS –CHOCOLATE CYST RO

FIG 41.USG

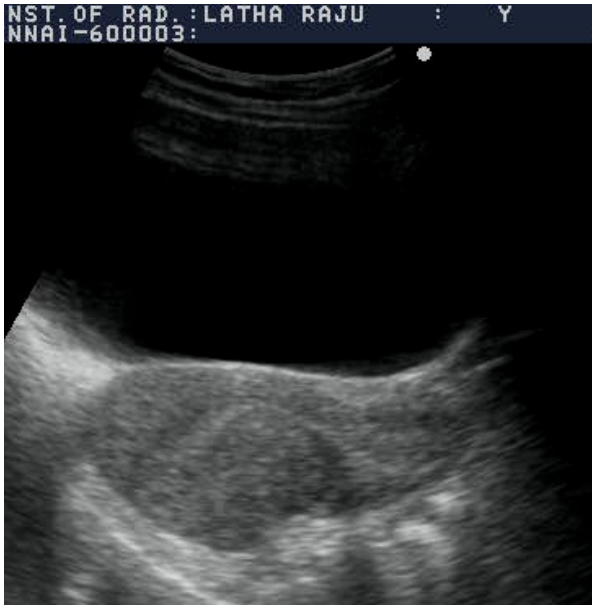


FIG 42.TV USG

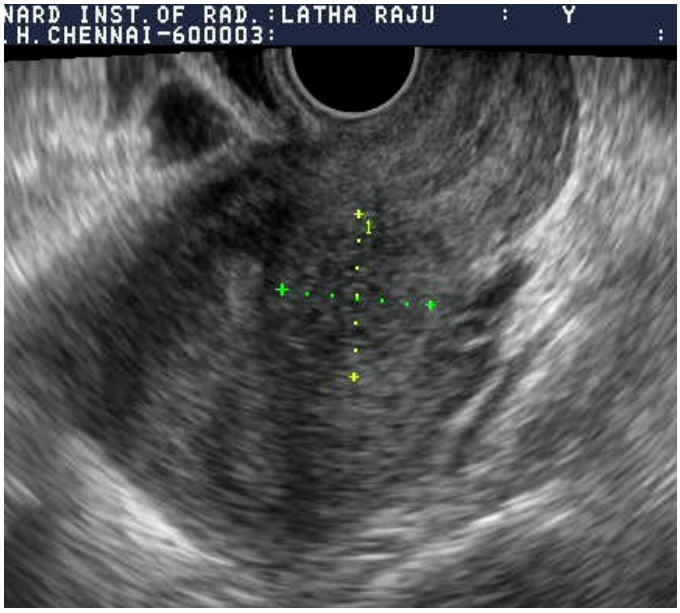
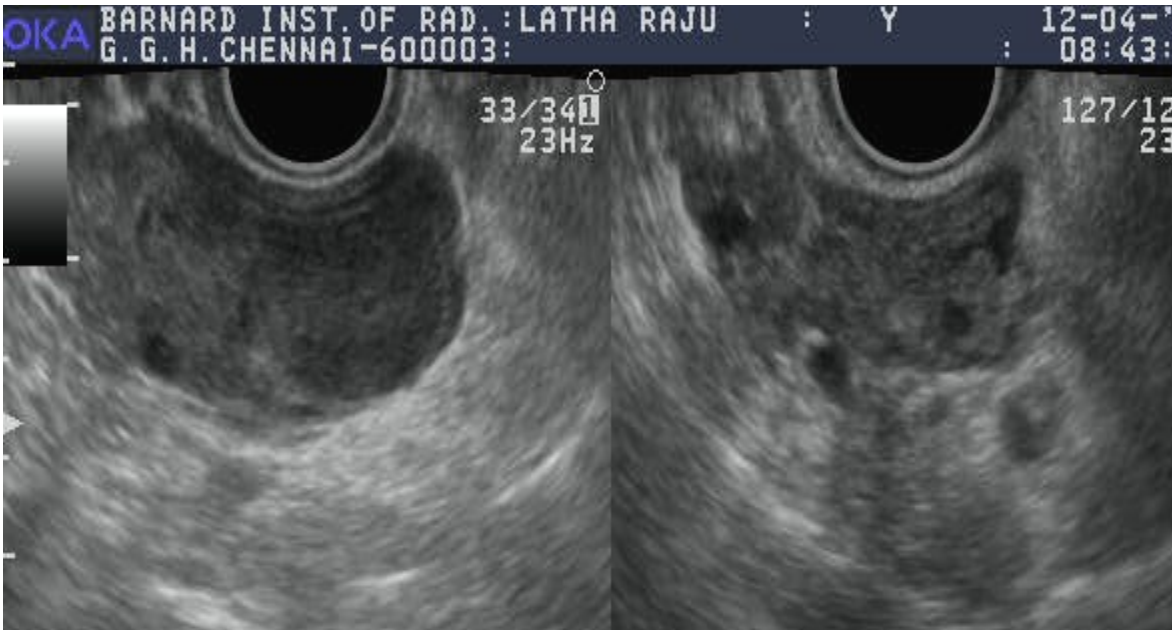


FIG 43.TV USG OVARIES



ENDOMETRIOSIS MRI

FIG 44.SAG T_1

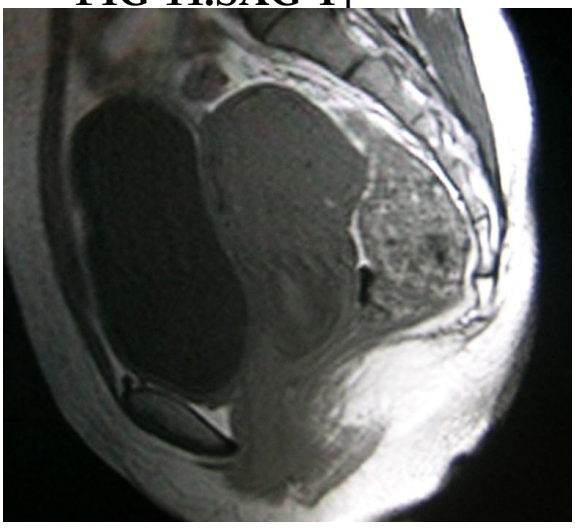


FIG 45.AXIAL T_1

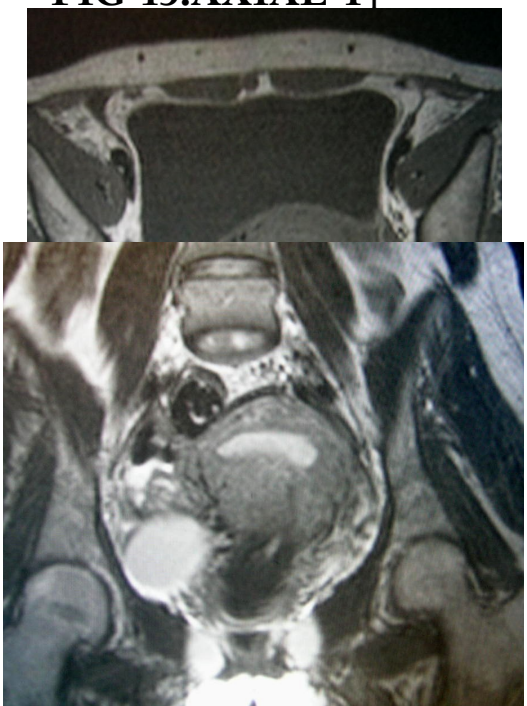


FIG 46.SAG T_2

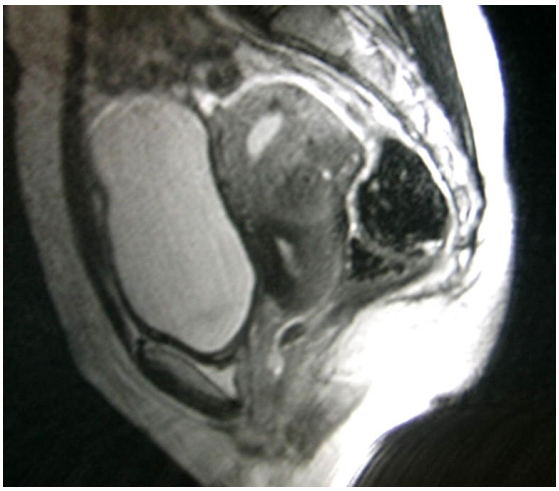
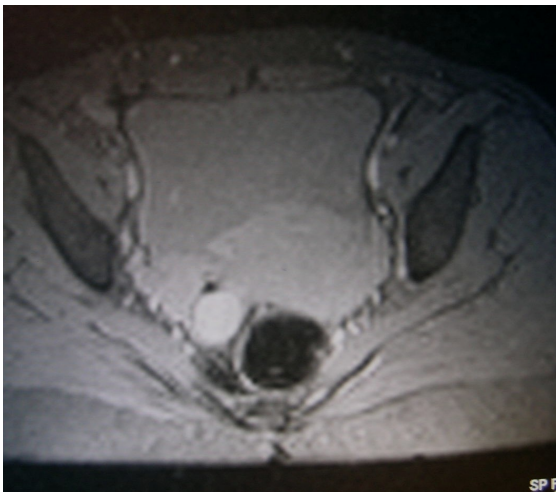


FIG 47.AXIAL T_2

FIG 48.FAT SAT T_2



The ability of MRI, Transabdominal ultrasound and Transvaginal ultrasound to characterize and diagnose the uterine mass lesions were compared with histopathological findings and were analysed, using various statistical tests. MR characteristics of each lesion were also evaluated.

The final histopathological findings after hysterectomy, myomectomy, fractional curettage, cervical biopsy were accepted as the reference standard against which the

Transabdominal ultrasound, Transvaginal ultrasound and MRI imaging findings were compared.

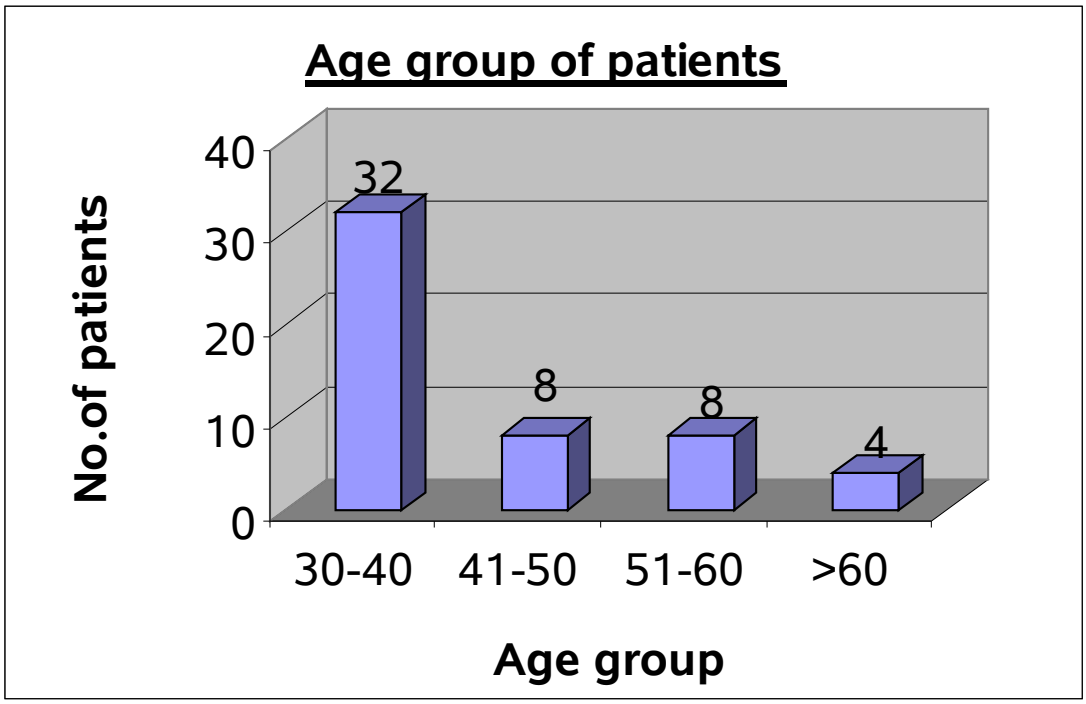
Diagonal agreement, Cohen's Kappa, Z value are calculated comparing two modalities like Transabdominal USG – MRI, Transvaginal USG – MRI, Transabdominal USG – Trans vaginal USG in detecting mass lesions in the uterus. Percentage of diagonal agreement implies number of cases detected as same final outcome regarding the presence of mass in both the modalities.

Sensitivity, specificity, correctclassification, misclassification, Kappa values calculated for each modality for all cases coming under each final diagnosis and finally compared.

Correctclassification is concordance between the diagnosis by that particular modality and HPE. Misclassification is discordance between the diagnosis by a modality and HPE. Cohen's Kappa is used to compare the correlation between the modalities. The values of Kappa were classified as 0.0-0.2 no correlation, 0.2-0.4 fair correlation, 0.4-0.6 moderate correlation, 0.6-0.8 good correlation, 0.8-1.0 very good correlation.

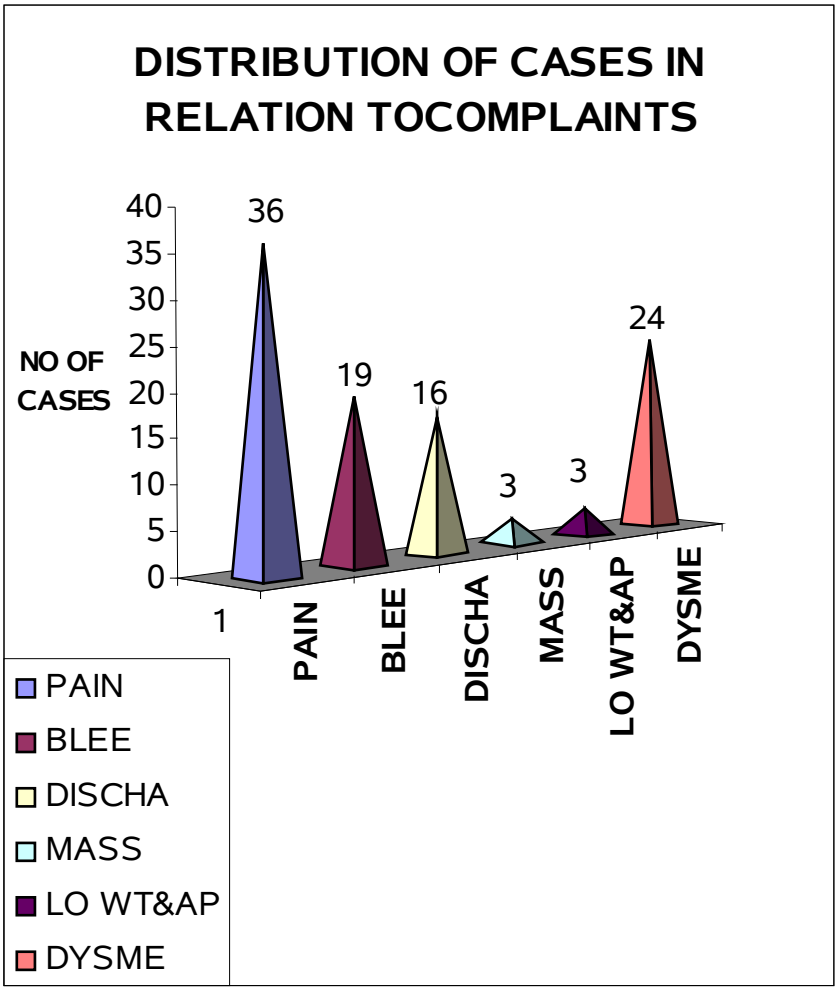
DISTRIBUTION OF PATIENTS IN RELATION TO AGE

Age of patients	No of patients	Percent
<40	32	61.5
41-50	8	15.4
51-60	8	15.4
>60	4	7.7
Total	52	100.0



DISTRIBUTION OF CASES IN RELATION TO PRESENTING COMPLAINTS

PRESENTING COMPLAINTS	NO OF CASES
PAIN	36
BLEEDING PV	19
DISCHARGE PV	16
MASS ABDOMEN	3
LOSS OF WEIGHT&APPETITE	3
DYSMENORRHOEA	24



MENOPAUSAL STATUS OF TOTAL PATIENTS

MENOPAUSAL STATUS	PERCENTAGE OF PATIENTS
PREMENOPAUSE	67%
POST MENOPAUSE	33%

DISTRIBUTION OF CASES AS PER FINAL DIAGNOSIS

DIAGNOSIS	NO OF CASES
ADENOMYOSIS	12
FIBROID	24
CA CERVIX	10
CA ENDOMETRIUM	3
ENDOMETRIAL POLYP	2
NORMAL	1

FINAL DIAGNOSIS	Mean Age
Adenomyosis	33.67
Fibroid	39.83
Endometrial Ca	54.50
Ca cervix	56.60
Cervical polyp	35.00

COMPARISON OF MODALITIES IN MYOMETRIAL MASS DETECTION

MYOMETRIAL MASS TRANSABDOMINAL, TV USG CROSSTABULATION

		TV USG MASS			
		mass absent	ill defined	present	Total
USG MASS	mass absent	18	2	1	21
	ill defined	1	2	9	12
	present	0	0	19	19
Total		19	4	29	52

DIAGONAL AGREEMENT ; 75%

COHEN`S KAPPA (K) ; 0.6

Z ; 6.16

P ≤ 0.01

MYOMETRIAL MASS TRANSABDOMINAL USG, MRI CROSSTABULATION

		MRI MASS			
		mass absent	ill defined	present	Total
USG MASS	mass absent	17	3	1	21
	ill defined	1	1	10	12
	present	0	0	19	19
Total		18	4	30	52

DIAGONAL AGREEMENT ; 71%

COHEN`S KAPPA (K) ; 0.54

Z ; 5.6

P ≤ 0.01

MYOMERIAL MASS TRANSVAGINAL USG, MRI CROSSTABULATION

		MRI MASS			Total
		mass absent	ill defined	present	
TRANS VAGINAL USG MASS	mass absent	18	1	0	19
	ill defined	0	3	1	4
	present	0	0	29	29
Total		18	4	30	52

DIAGONAL AGREEMENT ; 96%

COHEN`S KAPPA (K) ; 0.93

Z ; 8.09

P ≤ 0.01

CATEGORISING MYOMETRIAL MASS TRANSABDOMINAL USG, MRI CROSSTABULATION

		MRI					Total
		submucosal	intramural	subsero	subsero+ intramur	submuco+intramur+subsero	
USG	submuco	0	0	0	0	0	0
	intramural	5	6	0	0	0	11
	subsero	0	1	1	0	0	2
	subsero+ intramur	0	0	0	6	5	11
Total		5	7	1	6	5	24

DIAGONAL AGREEMENT ; 54%

COHEN`S KAPPA (K) ; 0.38

Z ; 3.89

P ≤ 0.01

CATEGORISING MYOMETRIAL MASS TRANSVAGINAL USG, MRI CROSSTABULATION

		MRI					Total
		submucosal	intramural	subsero	subsero+ intramur	submuco+intramur+subsero	
TV USG	submuco	2	0	0	0	0	2
	intramu	3	7	0	0	0	10
	subsero	0	0	1	0	0	1
	subsero+ intramur	0	0	0	6	5	11
Total		5	7	1	6	5	24

DIAGONAL AGREEMENT ; 67%

COHEN`S KAPPA (K) ; 0.55

Z ; 5.24

P ≤ 0.01

ADENOMYOSIS DETECTION TRANSABDOMINAL USG

TRANS ABDOMINAL ULTRASOUND	HPE			
		PRESENT	ABSENT	TOTAL
	PRESENT	4	0	4
	ABSENT	8	0	8
	TOTAL	12	0	12

SENSITIVITY : 33% (9% - 65%)

SPECIFICITY : 0%

CORRECT CLASSIFICATION : 33% (9% - 65%)

MISCLASSIFICATION : 67% (34%-94%)

KAPPA : 0 (poor agreement)

ADENOMYOSIS DETECTION TRANSVAGINAL USG

TRANS VAGINAL ULTRASOUND	HPE			
		PRESENT	ABSENT	TOTAL
	PRESENT	7	0	7
	ABSENT	5	0	5
	TOTAL	12	0	12

SENSITIVITY : 58% (28% - 85%)

SPECIFICITY : 0%

CORRECT CLASSIFICATION : 58% (28% - 85%)

MISCLASSIFICATION :42% (15%-82%)

KAPPA : 0 (poor agreement)

ADENOMYOSIS DETECTION MRI

MRI	HPE			
		PRESENT	ABSENT	TOTAL
	PRESENT	11	1	12
	ABSENT	0	0	0
	TOTAL	11	1	12

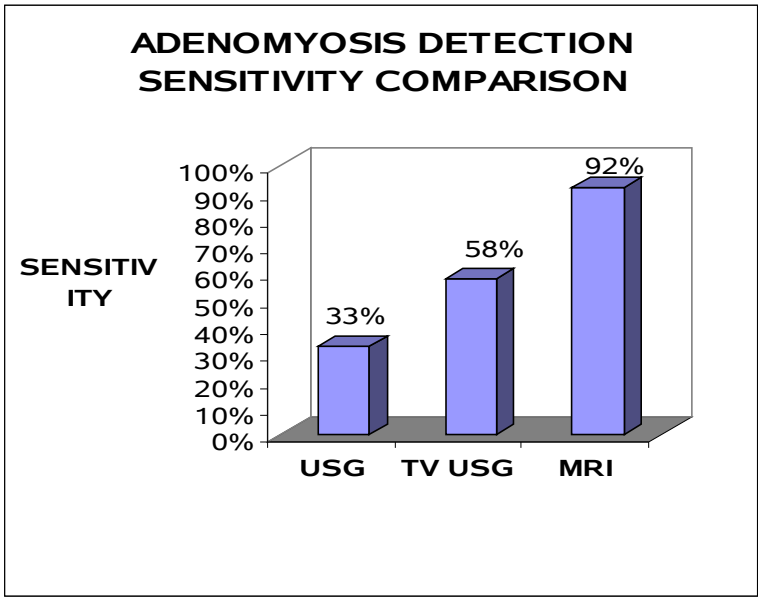
SENSITIVITY : 92% (62% -100%)

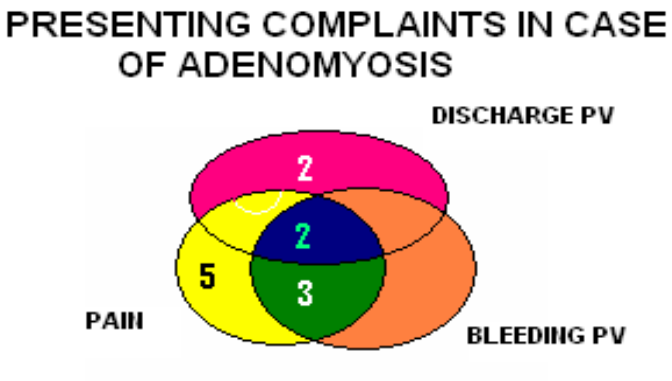
SPECIFICITY : 0%

CORRECT CLASSIFICATION : 92% (62% -100%)

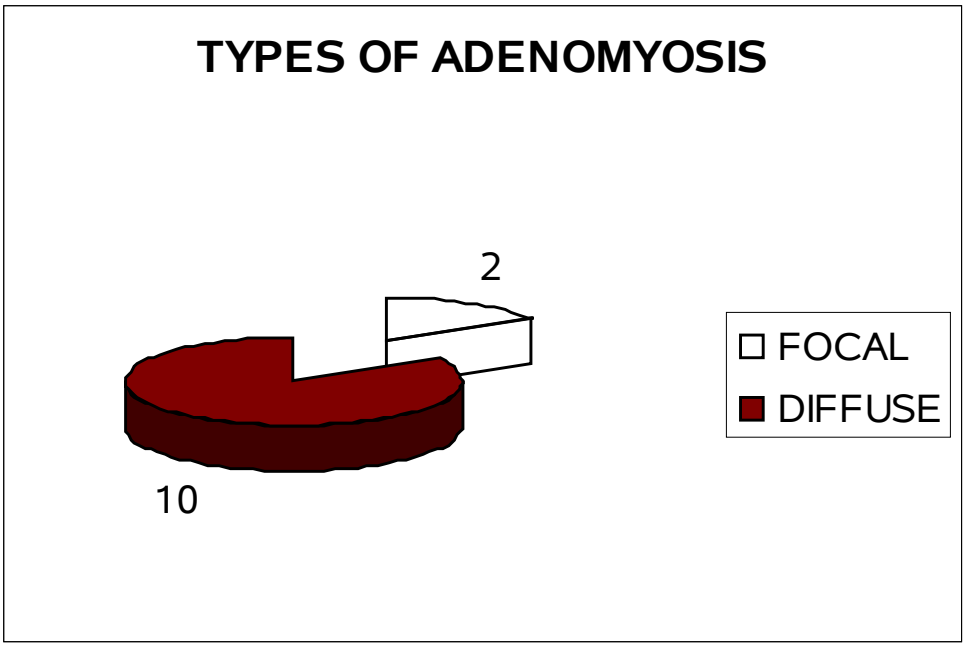
MISCLASSIFICATION :8% (0%-45%)

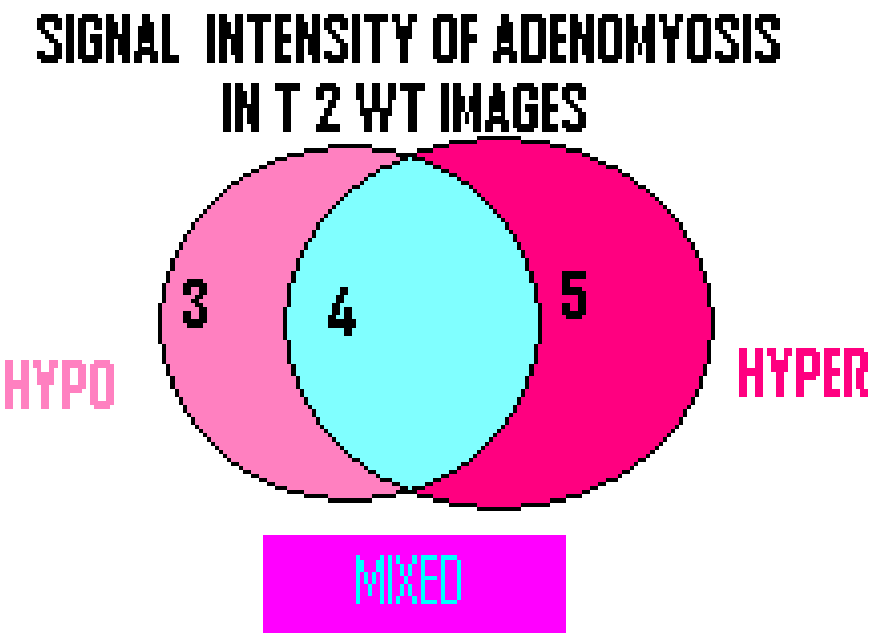
KAPPA : 0 (poor agreement)





TYPES OF ADENOMYOSIS	NO OF CASES
FOCAL	2
DIFFUSE	10


TYPES OF ADENOMYOSIS
2
10
FOCAL
DIFFUSE


SIGNAL INTENSITY OF ADENOMYOSIS
IN T 2 WT IMAGES
3
4
5
HYPO
HYPER
MIXED

DETECTION OF FIBROID BY TRANSABDOMINAL USG AMONG TOTAL CASES

TRANS ABDOMINAL USG	HPE			
		PRESENT	ABSENT	TOTAL
	PRESENT	19	4	23
	ABSENT	5	24	29
	TOTAL	24	28	52

SENSITIVITY : 79% (58% - 93%)

SPECIFICITY : 86% (67% - 96%)

CORRECT CLASSIFICATION : 83% (70% -92%)

MISCLASSIFICATION :17% (8%-32%)

KAPPA : 0.65 (Good)

P ≤ 0.01

DETECTION OF FIBROID BY TRANSVAGINAL USG AMONG TOTAL CASES

TRANS VAGINAL USG	HPE			
		PRESENT	ABSENT	TOTAL
	PRESENT	24	3	27
	ABSENT	0	25	25
	TOTAL	24	28	52

SENSITIVITY :100% (86% -100%)

SPECIFICITY : 89% (72% - 98%)

CORRECT CLASSIFICATION : 94% (84% -99%)

MISCLASSIFICATION : 6% (1%-7%)

KAPPA : 0.89 (Very good)

P ≤ 0.01

DETECTION OF FIBROID BY MRI AMONG TOTAL CASES

	HPE			
		PRESENT	ABSENT	TOTAL
MRI	PRESENT	24	1	25
	ABSENT	0	27	27
	TOTAL	24	28	52

SENSITIVITY :100% (85% -100%)

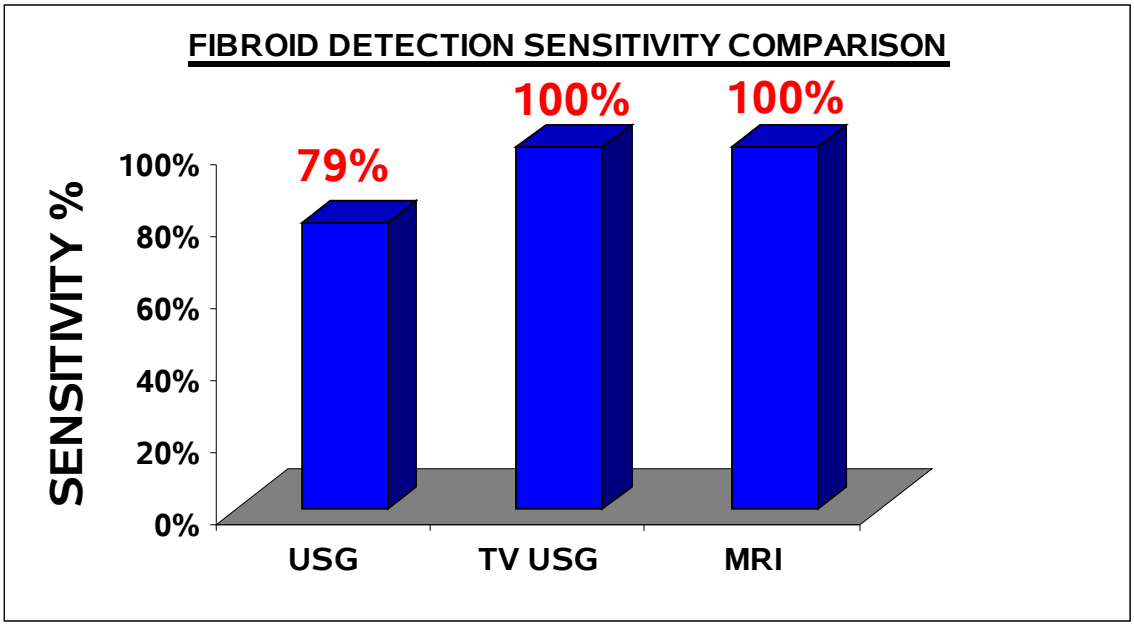
SPECIFICITY : 96% (82% -100%)

CORRECT CLASSIFICATION : 98% (90% -100%)

MISCLASSIFICATION :2% (0%-7%)

KAPPA : 0.96 (Very good)

$P \leq 0.01$



DIFFERENTIATION BETWEEN ADENOMYOSIS AND FIBROID BY TRANSABDOMTNAL USG

TRANS ABDOMINAL USG	HPE		
	ADENOMYOSIS	FIBROID	TOTAL
ADENOMYOSIS	4	13	17
FIBROID	8	11	19
TOTAL	12	24	36

SENSITIVITY :33% (10% -65%)

SPECIFICITY : 46% (26% -67%)

CORRECT CLASSIFICATION : 42% (26% -59%)

MISCLASSIFICATION : 58% (41%-69%)

POSITIVE PREDICTIVE VALUE : 24%(7%-50%)

NEGATIVE PREDICTIVE VALUE : 58%(34%-80%)

FALSE POSITIVE RATE : 54%(33%-74%)

FALSE NEGATIVE RATE : 67%(34%-90%)

KAPPA : 0.19 (Poor)
$P \geq 0.05$

MC NEMAR`S TEST X^2 1.19 P =0.38 (Not significant)

DIFFERENTIATION BETWEEN ADENOMYOSIS AND FIBROID BY TRANSVAGINAL USG

	HPE			
		ADENOMYOSIS	**FIBROID**	**TOTAL**
TRANS	**ADENOMYOSIS**	**7**	**2**	**9**
VAGINAL	**FIBROID**	**5**	**22**	**27**
USG	**TOTAL**	**12**	**24**	**36**

SENSITIVITY : 58% (28% -84%)

SPECIFICITY : 92% (73% -99%)

CORRECT CLASSIFICATION : 81% (64% -92%)

MISCLASSIFICATION : 19% (18%-42%)

POSITIVE PREDICTIVE VALUE : 78%(40%-97%)

NEGATIVE PREDICTIVE VALUE : 82%(62%-94%)

FALSE POSITIVE RATE : 8%(1%-27%)

FALSE NEGATIVE RATE : 42%(15%-72%)

KAPPA : 0.53 (Moderate)

P ≤ 0.01

MC NEMAR`S TEST X^2 1.29 P =0.45 (Significant)

DIFFERENTIATION BETWEEN ADENOMYOSIS AND FIBROID BY MRI

	HPE			
		ADENOMYOSIS	**FIBROID**	**TOTAL**
MRI	**ADENOMYOSIS**	**11**	**0**	**11**
	FIBROID	**1**	**24**	**25**
	TOTAL	**12**	**24**	**36**

SENSITIVITY : 92% (62% -100%)

SPECIFICITY : 100% (86% -100%)

CORRECT CLASSIFICATION : 97% (86% -100%)

MISCLASSIFICATION : 3% (0%-18%)

POSITIVE PREDICTIVE VALUE : 100%(72%-100%)

NEGATIVE PREDICTIVE VALUE : 96%(80%-100%)

FALSE POSITIVE RATE : 0%(0%-14%)

FALSE NEGATIVE RATE : 8%(0%-38%)

KAPPA : 0.93 (Perfect)

P ≤ 0.001

MC NEMAR`S TEST X^2 1. P =0.31 (Significant)

DETECTION OF ENDOMETRIAL CARCINOMA BY MRI AND TV USG AMONG TOTAL CASES

		HPE		
		PRESENT	ABSENT	TOTAL
TV USG AND MRI	PRESENT	3	1	4
	ABSENT	0	48	48
	TOTAL	3	49	52

SENSITIVITY **:100% (29% -100%)**

SPECIFICITY **: 97% (89% -100%)**

CORRECT CLASSIFICATION **: 97% (89% -100%)**

MISCLASSIFICATION **:3% (0%-7%)**

KAPPA **: 0.85 (Very good)**

P ≤ 0.01

DETECTION OF NABOTHIAN CYST COMPARISON BETWEEN TRANSABDOMINAL USG AND MRI

		MRI		
		PRESENT	ABSENT	TOTAL
TRANS ABDOMINAL USG	PRESENT	1	1	2
	ABSENT	8	0	8
	TOTAL	9	1	10

SENSITIVITY **:11% (0% -48%)**

SPECIFICITY **: 0%**

CORRECT CLASSIFICATION **: 10% (0% -45%)**

MISCLASSIFICATION **:90% (55%-100%)**

KAPPA **: 0.21 (Fair agreement)**

P ≤ 0.01

DETECTION OF NABOTHIAN CYST COMPARISON BETWEEN TRANS AGINAL USG AND MRI

		MRI		
		PRESENT	**ABSENT**	**TOTAL**
TRANS VAGINAL USG	**PRESENT**	**5**	**1**	**6**
	ABSENT	**4**	**0**	**4**
	TOTAL	**9**	**1**	**10**

SENSITIVITY	**:56% (21% -86%)**
SPECIFICITY	**: 0%**
CORRECT CLASSIFICATION	**: 50% (19% -81%)**
MISCLASSIFICATION	**:50% (81%-86%)**
KAPPA	**: 0.19 (Fair agreement)**

P ≤ 0.01

DISCUSSION

Transabdominal USG, transvaginal USG and MRI were performed on 52 patients who were referred from the Institute of Obstetrics and Gynaecology for evaluation of uterine mass lesions. Depending upon the final diagnosis they underwent myomectomy, hysterectomy, endometrial curettage or cervical biopsy. The patients were in the age

group ranging from 30 to 65 yrs. 32 patients in 30 to 40 yrs, 8 in 40 to 50 yrs, 8 in 50 to 60 yrs and 4 over 60 yrs, with the mean age of 42.5 yrs.

68% of the patients were in the premenopausal age group, 33% of the patients were in the postmenopausal age group. In our study most of the patients were in the reproductive age group. This is because benign mass lesions are more commonly seen in this age group.

This is emphasized by **VG Padubidri, Shirish N Daftary, etal**[38] . Out of 52 patients in our study, 36 patients (69.2%) presented with complaints of pain, 19 (37%) patients had bleeding, 3 patients (6%) had mass felt by themselves, 16 patients (31%) had discharge PV, 1 patient (1.9%) with loss of weight, 3 patients (5.8%) with loss of appetite. Few had more than one complaint. But the common presentations were pain abdomen, bleeding PV and discharge PV.

Among the total 52 patients, all were married except 2 (3.8%). Among the married patients, all had more than one child except 5 (9.6%) who had infertility. Among the total 52 patients 29% had permanent sterilization. In the remaining 71%, 20% of the patients were practicing temporary contraception.

Among the premenopausal patients, 33% presented in the proliferative phase, 33% in the secretory phase. Among the total patients 21% had increased flow, 7% had increased flow with clots during menstruation, 46% had dysmenorrhoea.

The total patients were subgrouped into 5 depending upon the histopathological diagnosis. Adenomyosis –12 patients; Fibroid –24 patients; Endometrial carcinoma –3 patients, Carcinoma cervix -10patients, Cervical polyp -2 patients. Among the total patients 17 had adnexal lesions, 4 patients had mass lesions and 13 had cysts. Among 13

patients with cysts, one patient had endometriotic cyst. Sensitivity and specificity were calculated for each modality in each subgroup and compared.

First in detection of myometrial mass lesions, 3 sets of data are derived by comparing two modalities in each. When comparing transabdominal USG and MRI in myometrial mass lesion detection the diagonal agreement was 71%. It means only 71% of the mass lesions seen in MRI is seen in the USG. Diagonal agreement between the transvaginal USG and MRI is 96%. Diagonal agreement between the transabdominal USG and transvaginal USG is 75%.

In classifying myometrial mass lesions, the diagonal agreement between USG and MRI is 54%, between transvaginal USG and MRI is 67%. This is because sub mucosal lesion detection is zero with transabdominal USG and only two submucosal lesions among 6 were diagnosed in transvaginal USG. But all are seen in MRI.

Localizing the site of lesion and number of lesions is best with MRI. It gives visual picture to the surgeon. All infertile women going for uterine preservation surgery should undergo MRI before planning the surgical procedure.

Among fibroids 2, 4, 5 patients showed cystic degeneration with transabdominal ultrasound, transvaginal ultrasound and MRI respectively.9,10,4 patients show calcification in transabdominal ultrasound, transvaginal ultrasound and MRI respectively.

Among total 52 cases, the sensitivity of USG in detecting fibroid is 79%, specificity is 86%, and kappa is 0.65 (adequate), $P < 0.01$ stating that it is statistically significant.

Tranvaginal ultrasound in detecting fibroid the sensitivity is 100%, specificity is 89%, and kappa is 0.89, $P \leq 0.01$. In MRI the sensitivity is 100%, specificity is 96%.

This is because in MRI one case reported as having both adenomyosis and fibroid turned out to be a focal adenomyoma with diffuse adenomyosis. No fibroid was found. In USG many intramural lesions of adenomyosis are reported as fibroid reducing the specificity.

Duiak CM, Turner DA, Patel SK, Archie JT, Silver B, Norusis M etal[39] on their study on uterine leiomyomas in the infertile patient on 11 women reported the sensitivity of MRI as 85%, accuracy 94% is better than the USG (Transabdominal) sensitivity 69%, accuracy 87%. The specificity of the modalities did not significantly differ and concluded that MR imaging is superior to USG or HSG for preoperatively locating leiomyomas. This study correlates with the findings of our study with the USG sensitivity of 79% and MR sensitivity of 100%.

Zawin M, Mc carthy S, Scout LM, Comite F et al[40] studied high-field MRI and USG evaluation of pelvis in women with leiomyomas of 23 women. They have observed accurate determination of uterine volume was possible in all cases by MRI, but was limited on USG in uterus larger than 140 cc. Marked enlargement obscured the visualization of contour abnormalities in USG. Endometrial stripe and junctional zone could not be adequately visualised in 21 out of 23 ultrasound examinations. MRI detects more submucosal (14) lesions and concluded that MRI is superior to the ultrasound in pelvic examination of women with leiomyoma. This correlates with our study in which transabdominal ultrasound did not detect any submucosal lesions. Transvaginal detected two out of 6 lesions and MRI detected all 6 lesions.

Among 12 patients who had adenomyosis histopathologically 10 of them had pain, 5 patients had bleeding PV, 5 patients had both, 4 had discharge PV. Dysmenorrhoea was present in 10 of them.1 patient had infertility. All patients were in

the age group of 31-39 years. This fits in with the **VG Padubidri, Shirish N Daftary et al**[38] report that adenomyosis is usually seen in parous women around the age of 40 who present with menorrhagia and progressively increasing dysmenorrhoea. Pelvic discomfort and dyspareunia are the other symptoms of adenomyosis.

In the transabdominal ultrasound 8 of them had inhomogenous myometrial echo. 11 of them had myometrial inhomogeneity in transvaginal scan. 7 patients had anterior, posterior wall myometrial asymmetry in both transabdominal and transvaginal ultrasound. 4 patients had suspicious intramural hypoechoic lesion in the abdominal scan. They were taken as positive for adenomyosis by transabdominal ultrasound.

All 7 patients had posterior wall myometrial cyst. 3 of them had both anterior and posterior wall cyst in transvaginal scan.

In MRI among 12 positive cases all had ill defined mass in the myometrium. All patients had altered signal intensities in the myometrium. 3 of them had hyperintense signal in both T_1 and T_2 weighted sequences suggestive of haemorrhagic endometrial glands. In the rest 9, 4 of them had hyperintense signals in T_2 weighted sequences and 5 patients had hypointense areas which were ill defined in T_2 weighted sequences.

All patients had junctional zone above 10 mm with junctional zone myometrial ratio of above 23 in positive cases of adenomyosis. In one patient who had focal adenomyosis the junctional zone thickness was 9 mm. Among 12 total patients of adenomyosis one patient had fibroid and adenomyosis, 9 had diffuse adenomyosis, 2 had focal adenomyoma.

Among 12 positive cases of adenomyosis comparing to histopthological examination, sensitivity of transabdominal ultrasound is 33% in detecting adenomyosis.

Kappa is 0 suggestive of poor agreement. Sensitivity of transvaginal ultrasound is 58% kappa is 0 suggestive of poor agreement. Sensitivity of MRI is 92% kappa showed poor agreement. This is because we have taken only positive cases of adenomyosis. No normal cases were sent for imaging. Specificity cannot be calculated when only positive cases were taken into account. But among three modalities MRI is more sensitive in detecting adenomyosis. Even then the sensitivity is only 92% because one case considered as fibroid by MRI turned out to be focal adenomyoma with normal junctional zone thickness.

In differentiating between adenomyosis and fibroid, specificity of Transabdominal ultrasound, Transvaginal ultrasound and MRI in our study inturn is 46%,92%,100%.Positive predictive value is 24%,78%,100%.Negative predictive value is 58%,82%,96% and False positive rate is 58%,8%,and 0%.

Kang S, Turner DA et al[41] study on Adenomyosis: specificity of 5mm as the maximum normal uterine JZ thickness in MR images concluded that if a diagnosis of adenomyosis is based solely on junctional zone thickness in MR images, 5mm should not be assumed as upper limit of normal. Because this assumption may result in a high false positive rate. Our study has showed 10 mm as minimal JZ thickness which goes by the norms of the above study.

Phillips etal[42] study on 20 patients confirmed MRI diagnosis of adenomyomata by transabdominal uterine biopsy or by resectoscopic endometrial biopsy in all 20 patients. Similar to this our study diagnosed all 12 positive cases in MRI.

Ascher SM et al[12] study on 20 women, underwent Transvaginal ultrasound and MRI Pathological proof obtained in all cases. 17 had adenomyosis. 15/17 cases correctly

diagnosed in MR. One false positive and 2 false negative diagnosis were made in MR. With transvaginal ultrasound 9/17 cases were correctly diagnosed. One false positive and 8 false negative and reported most frequent causes of false negative diagnosis with transvaginal ultrasound is misinterpretation of adenomyosis as leiomyoma.

Similar to the above study, in our study one case considered as fibroid by MRI turned out to be focal adenomyoma. Only 7out of 12cases were diagnosed correctly as adenomyosis in TV USG because of misinterpretation of adenomyosis as leiomyoma.

Above fact is emphasized by Tamai **K, Togashi K etal**[43] study on MR Imaging findings of adenomyosis correlation with histopathologic features and diagnostic pitfalls. They have reported pitfalls in diagnosis of adenomyosis including myometrial contractions, leiomyoma, adenomatoid tumour, metastasis, endometrial carcinoma and endometrial stromal sarcoma. Concluded that knowledge of various appearances of adenomyosis and the possible pitfalls in differential diagnosis help guide the determination of appropriate treatment options.

Similar to our study, **Mark AS etal**[44] study on 21 premenopausal patients, 8 had adenomyosis, 12 had fibroids and 1 normal. All 8 adenomyosis diagnosed on MRI. 10/12fibroid correctly diagnosed in MRI. In 2 cases differentiation between adenomyosis and fibroid was difficult.

Our study correlates with the study of **Reinhold C etal**[11] study in which 25/29 cases were diagnosed positive for adenomyosis in transvaginal ultrasound with a sensitivity of 86%, specificity of 86% positive predictive value of 71% and negative predictive value of 94%.In Transabdominal ultrasound 21/25 (84%) had heterogenous

echotexture, 3(12%) had hypoechoic areas with cysts, heterogenous areas in myometrium in 1(4%) patient

Togashi K, Ozaga H etal[7] study on 93 patients, 71 had fibroid, 16 had adenomyosis, 6 had both fibroid and adenomyosis. In our study on 52 patients 24 had fibroid, 12 had adenomyosis,1 had both fibroid and adenomyosis.

Byun JY etal[5] study 66.7% (30cases) had diffuse adenomyosis and 33.3% (15) had focal adenomyoma. In diffuse adenomyosis JZ is 7-37mm.High signal intensity foci seen in T_2 weighted Images only in 4 and on both T_1 and T_2 weighted images in 11 of focal adenomyoma. In comparison to this in our study 10 had diffuse adenomyosis, 2 had focal adenomyosis. JZ thickness varies from 10 to 22 mm.

One patient had associated chocolate cyst (Endometriosis) in our study. **Sugimura K, Okizuka H, Imaoka J, Kaji Y, Takahashi K, Kitao M, Ishida T. et al**[16] in their study on endometriosis in 35 women concluded that diagnostic accuracy was improved with addition of fat saturated images. So their use together with conventional images is recommended in assessment of endometriosis.

In detecting endometrial carcinoma in our study, MRI is 100% sensitive but specificity is 97%. Kappa is 0.85 with very good agreement. $P \leq 0.01$ statistically significant. The reduction in specificity is because one case considered as endometrial carcinoma stage 1a was normal by histopathology in our study. It showed small hyper intense foci breeching the junctional zone. On retrospective review of the image and correlating with the clinical history and HPE report, it was concluded that the MR finding may be due to the fractional curettage done two days earlier. No contrast imaging was done at that time. This suggests that MRI finding does not obviate the need of

endometrial biopsy and fractional curettage which is important in deciding about the final diagnosis.

This is emphasized by **Buyak E etal**[50] and associates study on endometrial disease diagnosed by transvaginal ultrasound and dilatation and curettage concluded that fractional curettage seems to be the best method for detecting endometrial abnormalities in women with post menopausal bleeding.

Yamashita Y, Mizutani H etal[28] and associates prospectively studied assessment of myometrial invasion by endometrial carcinoma: Transvaginal sonography versus Contrast enhanced MR imaging in 40 patients and classified depth of myometrial invasion stage E (Tumours limited to endometrium), Stage S (Superficial invasion tumour invades upto 50% of myometrium), Stage D deep invasion (Tumour invades more than 50% of myometrium). Compared the accuracy of TVS, unenhanced T_2 weighted (68%) and contrast enhanced (85%) T_1 weighted imaging and concluded that contrast enhanced T_1 weighted MR imaging is significantly superior.

False positivity in T_2 weighted imaging was due to distension of endometrial cavity by pyometra, the presence of myoma, atrophy of the myometrium and poor tumour- myometrium contrast. Increased accuracy in contrast enhanced images was due to increased ability to distinguish between tumour, endometrial cavity, tumour invaded myometrium and residual myometrium. Applying the above findings to our study if contrast enhanced MRI had been performed false positive diagnosis of endometrial carcinoma would have been avoided.

Ascher SM[49] **etal** and associates study on uterine changes after dilatation and curettage the MR Imaging findings reported that marked hypointense curvilinear areas in

the endometrial canal on day 2 scans in all patients, (P=.0002). By day 7 either they decrease in size or completely resolve. No significant change in the width of the endometrial stripe or signal intensity of the junctional zone or myometrium after D&C. The junctional zone was focally disrupted in one patient who had complication of uterine perforation.

In another study on diagnosis of abnormal uterine cavity concluded that malignancy can be diagnosed when the lesion invaded the myometrial junctional zone or lesion enhancement was lower than that of the adjacent myometrium.

In identifying nabothian cyst comparison between the transabdominal ultrasound, and MRI, transabdominal ultrasound was sensitive only in 11% of patients. Specificity cannot be calculated. Kappa is only 0.2 suggestive of fair agreement.This is because penetration of ultrasound waves is poor to visualize cervix better. On comparing transvaginal ultrasound with MRI the sensitivity is 56%. Kappa is 0.19. This is because when patient has multiple lesions with distortion of uterine anatomy identification of nabothian cyst is difficult. Very small cysts less than 5mm are also picked up in MRI because of specific high signal intensity in T_2 weighted images and also due to possibility of imaging in all three planes.

In case of carcinoma cervix as all the patients came at or after stage IIb, all cases were detected correctly by all the modalities. But here MR plays a main role only in staging because if vaginal wall or parametrial involvement is detected it upgrades the staging. Parametrial invasion is detected mainly in T_2 axial or contrast enhanced T_1 weighted axial images because breech in the hypointense line of the outer stroma is better

seen in axial images. Vaginal and body extensions are better seen in sagittal and coronal images.

Shiraiwa M etal[55] and associates reported that thin section oblique axial T_2 weighted images provide accurate cross section of cervix with excellent detail and detected parametrial invasion more accurately than did axial T_2 weighted Images.

Haematometrocolpos are also better seen in T_2 weighted or T_1 weighted images. Fat sat T_2 weighted Images and gradient images better demonstrated haematometrocolpos in two cases, haematosalphinx is also better visualized in coronal and sagittal images.

This finding can be made use of in diagnosing haematosalphinx in case of primary amenorrhoea.

Outwater GK etal[48] in his study on 41 surgically proven patients with dilated fallopian tubes looked for MR characteristics of dilated tubes, T_1 and T_2 weighted FSE sequences were done. He evaluated for dilated fallopian tube, thickened tubal wall, mucosal folds and Signal intensity of intratubal fluid. Hyperintense tubal fluid in T_1 weighted sequences corresponds to endometriosis.

In our study one case had large left iliac adenopathy which was eroding the iliac bone. This was thought to be an adnexal mass by transabdominal ultrasound. But the lesion was not reachable in transvaginal ultrasound. Normal structures were seen between the uterus and the mass in transvaginal scan suggesting that the origin of the mass is not from adnexa. But MRI due to it`s large FOV, was able to cover the entire area and proved it to be only iliac node with displacement of iliac vessels with thrombosis.

This concludes, for staging carcinoma cervix, MRI is the modality of choice and if possible contrast enhanced MRI for better detection of extensions.

Two cases were diagnosed as cervical polyp by MRI. Diagnosis of cervical polyp is a clinical one and is not easy with transvaginal and transabdominal ultrasound. One case was prolapsing fundal fibroid with cyst in the pedicle correctly diagnosed by MRI. It was diagnosed as nabothian cyst in transvaginal ultrasound. Another case was fibroid polyp arising just above the endo / ecto cervical junction. It was better delineated in coronal MRI. Exact length of the pedicle can be measured and given to the surgeon. Coronal images give a better mental picture to the surgeon for hysteroscopic removal.

The above finding of better delineation of prolapsing mass by MRI is emphasized by the following study. **Panageas E, Kier R, Mc cauley TR, Mc carthy S etal**[30] study on submucosal leiomyomas, diagnosis of prolapse into cervix and vagina based on MR Imaging on 5 patients described the MR appearance, signs and symptoms and pathological findings of submucosal leiomyoma that prolapse into cervical or vaginal canal and concluded that MR Imaging is useful for diagnosis and characterisation of uterine leiomyomas that have prolapsed into the cervical or vaginal canal.

The final diagnosis by MRI significantly alters the surgical management. All the lesions of the uterus are better characterised by MRI. Better localisation of the site and exact number can be detected with MRI. Exact measurements, circumference of the lesion and degenerative changes can be told by MRI. The exact extent of the mass lesions was better depicted in MRI which helps in staging the tumour.

SUMMARY

Transabdominal ultrasound, transvaginal ultrasound and MRI were performed in 52 patients referred for uterine mass lesion characterisation from Department of Obstetrics and Gynaecology.

The patients belong to age group ranging from 30 to 65 years. 68% of them were premenopausal age group. Main presenting complaints were pain (69%), bleeding PV (37%) and discharge PV (32%). Infertility present in 9.6%. 46% had dysmenorrhoea. Total patients were sub grouped into five depending upon the histological diagnosis. Adenomyosis - 12 patients, fibroids - 24 patients, endometrial cancer - 3 patients, cancer cervix - 10 patients, cervical polyps - 2 patients. 17 patients had associated adnexal pathology. In general, comparison of modalities to detect myometrial masses, ultrasound is the best screening modality. Diagonal agreement between transvaginal ultrasound and MR is 96%. So transvaginal ultrasound can be used to detect myoma, but to characterise myometrial masses diagonal agreement between transvaginal ultrasound and MRI is 67% mainly due to mistaken diagnosis of adenomyosis as fibroid in transvaginal ultrasound.

Localising the site of lesion and number of lesions is best with MRI. For submucosal lesion detection MRI is the best. Sensitivity of the transabdominal ultrasound, transvaginal ultrasound and MRI in turn in detecting fibroids is 79%, 100% and 100%. Specificity in turn is 86%, 89%, 96%. So transvaginal ultrasound can be used to detect fibroid. But for differentiation of a fibroid from adenomyosis MRI is the modality of choice.

Among 12 patients with positive adenomyosis all of them were in the age group 31 to 39 years. 10 had dysmenorrhea. Junctional zone thickness ranged from 10 – 22

mms. Junctional zone myometrial ratio ranged from 23-43. One case diagnosed as fibroid by MRI turned out to be focal adenomyoma. Among 12 patients, 10 had diffuse adenomyosis and 2 had focal adenomyoma. Only 7 out of 12 patients were diagnosed correctly by Transvaginal USG because of misinterpretation of adenomyosis as leiomyoma.

Sensitivity of transabdominal ultrasound, transvaginal ultrasound and MRI in detecting adenomyosis in turn is 33 %, 58% and 92%. So MRI plays a key role in making definitive diagnosis of adenomyosis.

In detecting endometrial carcinoma MRI is 100% sensitive and 97% specific. $P \leq 0.01$. It is statistically significant. One case diagnosed as endometrial carcinoma by MRI turned out to be normal in HPE. Number of positive cases of endometrial carcinoma is only 3. So there is a need to evaluate more positive cases. When there is endometrial carcinoma and polyp together it can be better characterized in MRI. Diagnosis of Endometrial carcinoma can be made by all 3 modalities. But myometrial invasion is better detected by MRI. Unenhanced T_2 weighted imaging can upstage because of surrounding oedema. But contrast enhanced T_1 weighted imaging will make definitive staging. Dilatation & Curettage / fractional curettage is a must in making the final diagnosis.

Nabothian cyst can be identified in all the modalities. But when patient has distorted uterine anatomy it is better identified in Transvaginal USG with sensitivity of 56% and MRI with sensitivity of 100%. Very small cysts are also identified in MRI. They usually appear hypo in T_1 and hyper in T_2 weighted sequences. In few cases it is hyper in both T_1 and T_2 weighted sequences.

In case of carcinoma cervix all patients who came for imaging were at or above stage II b. So all modalities correctly diagnosed cancer cervix. But exact staging was possible only with MRI. Oblique axial T_2 weighted sequence was more useful. Haematometrocolpos was seen in 2 patients. They also had haematosalphinx. It is better seen with fat saturation T_2 weighted sequences and gradient sequences. One patient had large left iliac adenopathy with bony erosion diagnosed as adnexal mass in transabdominal USG and not reachable in transvaginal USG. Only MRI diagnosed it correctly and also associated displacement of the iliac vessels and thrombosis.

In case of cervical polyp MRI made correct diagnosis regarding the nature of the lesion as prolapsing fibroid and also the pedicle length.

To summarise, all lesions of the uterus are better characterized by MRI. Definitive differentiation of adenomyosis and fibroid is possible with MRI. Definitive staging of malignant lesion is possible with MRI.

CONCLUSION

High spatial resolution MR imaging with CP spine Array coil is accurate for characterisation, localisation and evaluation of the number of lesions in benign uterine mass lesions and for staging of malignant mass lesions.

Pelvic MRI is the best modality to diagnose adenomyosis. Transabdominal USG can be used as a screening modality to diagnose myometrial masses like fibroid. Calcific degeneration is better identified by Transabdominal USG and Transvaginal USG. Cystic degeneration is better identified with Transvaginal USG and MRI. Submucosal lesions are better characterised by MRI than Transvaginal USG.

In endometrial lesion detection Transvaginal USG can be used as a screening modality. Transabdominal USG is not useful. T_2 weighted sequences and contrast enhanced T_1 weighted MRI sequences are useful in lesion characterisation. In cases of endometrial carcinoma MRI diagnosis cannot obviate the need for endometrial biopsy. Myometrial invasion & extension of lesion are better detected by MRI in case of endometrial carcinoma.

In cervical lesions MRI detects even smaller nabothian cysts than Transvaginal USG and Transabdominal USG. Cervical polyps are accurately diagnosed. Extent of ca cervix, parametrial invasion, body or vaginal extension, haematometrocolpos and haematosalphinx are better detected in MRI than Transvaginal and Transabdominal USG which helps in accurate staging.

As the surgical approach for fibroid and adenomyosis are drastically different, MRI should be used in preoperative evaluation of all suspected cases of adenomyosis and infertility.

Finally we conclude that pelvic MR Imaging compared to Transabdominal and Transvaginal USG is a well tolerated, non invasive and accurate modality to characterise uterine mass lesions with excellent histopathological correlation. It is therefore an ideal and accurate preoperative imaging modality for characterising, localizing and detecting number & extent of uterine mass lesions.

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ABBREVIATION

MRI	-	Magnetic Resonance Imaging
TVUSG	-	Transvaginal ultrasound
USG	-	Ultrasound
Wt	-	Weighted
SI	-	Signal Intensity
Fatsat	-	Fat saturation
Ca	-	Carcinoma
EM	-	Endometrium
HPE	-	Histopathological examination
USG	-	Transabdominal Ultrasound
TV	-	TransVaginal ultrasound
MRI	-	Magnetic Resonance Imaging

MR EVALUATION OF UTERINE MASS LESION IN CORRELATION WITH TRANSABDOMINAL, TRANSVAGINAL ULTRASOUND, HPE AS GOLD STANDARD.

PROFORMA

Name: Age: Sex:

Occupation: S.No: IP/OP No:

Husband`s Name: Husband`s occupation: Family income:

Educational Status: Socio Economics status:

Address:

HISTORY:

PRESENTING COMPLAINTS

PAIN	BLEEDING PV	MASS	DISCHARGE PV	LOSS OF WEIGHT	LOSS OF APPETITE	NAUSEA, VOMITING	ALTERED BOWEL HABITS

HISTORY OF PRESENTING ILLNESS:

SYSTEMIC COMPLAINTS:

FEVER	CYSTOCELE	RECTOCELE	URINARY RETENTION	STRESS INCONTINENCE

MENSTRUAL HISTORY:

Age at menarche _____Yrs.

Post menopausal / Pre menopausal:

CYCLES:

Regular / Irregular

If irregular - Amenorrhea

- Polymenorrhoea
- Menorrhagia
- Metrorrhagia

Once in _____ days. Menstruation lasts for _____ days.

FLOW

NORMAL	SCANTY	INCREASED	INCREASED WITH CLOTS

Dysmenorrhea - Yes

- No
- Associated with drugs.

LMP: _____/_____/_____(dd/mm/yyyy)

Phase of Menstrual cycle - Menstrual

- Proliferative
- Secretory

MARITAL HISTORY:

Not married _____. Widow _____. Separated _____.

Married for _____Yrs. Age at Marriage_____Yrs.

Partners _____.

CONTRACEPTIVE HISTORY

History of Contraceptive use: Yes/ No

Type	Y/N	Duration
Natural		
Barrier		
OCP		
IUCD		

OBSTETRIC HISTORY

Total children: Male: Female:

FTND LCB Abortions - Induced

- Spontaneous

Ectopic

HISTORY OF INFERTILITY: Yes / No.

Duration:

History of Ovulation induction medication:

PERSONAL HISTORY:

Smoking: Veg / Nonveg

PAST HISTORY:

Hypertension / Diabetes / Tuberculosis.

FAMILY HISTORY:

TREATMENT HISTORY:

Biopsy RT Surgery Chemotherapy

GENERAL EXAMINATION:

Build: Weight: Anemia: Lymphadenopathy: Hirsutism:

SYSTEM EXAMINATION:

CVS: RS: CNS:

ABDOMEN EXAMINATION:

Ascites

MASS **Size:**

Site:

Mobility:

Tenderness:

Adhesion to other structures:

Hepatosplenomegaly:

Others

PR – **Rectal Mucosa** **Free / Not**

Bleeding **Mass**

PERSPECULUM

CERVIX

ULCER	MASS	POLYP	DISCHARGE	BLEEDING

PERVAGINUM

CERVIX:

UTERUS: **AV/RV**

Size: **normal** **enlarged**

regular **/** **irregular**

Mobility:

Tenderness:

Mass:

Additional adnexal mass / tenderness:

Discharge pv:

ULTRASONOGRAPHY:TRANSABDOMINAL:

UTERUS:

Size:

Contour : Regular / Lobulated

Endometrium: Homogenous / Inhomogenous

Echogenic/ Hypoechoic

Endometrial Thickness:

Endometrial Cavity Fluid: **+ / -**

Mass Lesion: Single / Multiple

Description of the Mass:

Myometrium: Homogenous / Inhomogenous

MASS

SUBMUCOSAL: **INTRAMURAL:** **SUBSEROSAL:**

Hypo Echoic	Hyper Echoic	Mixed Echoic	Areas of Calcification	Areas of cystic Degeneration	Shadowing + / -

CYST:

Single	Multiple	Anterior Myometrium	Posterior Myometrium

Description of the lesion:

Bladder wall indentation: **+ / -**

Cervix : Normal / Abnormal

Mass: + / -

OVARIES: RIGHT / LEFT

Visualised:

Mass:

LYMPHADENOPATHY:

OTHER ORGANS:

HYDRONEPHROSIS: RIGHT / LEFT

<u>TRANSVAGINAL ULTRASOUND</u>

<u>UTERUS:</u>

Endometrium: Homogenous / Inhomogenous

Echogenic / Hypoechoic

Endometrial Thickness:

Endometrial Cavity Fluid: **+ / -**

Mass Lesion: Single / Multiple

Description of the Mass:

Myometrium: Homogenous / Inhomogenous

Symmetric / Asymmetric

<u>MASS:</u>

SUBMUCOSAL: **INTRAMURAL:** **SUBSEROSAL:**

Hypo Echoic	**Hyper Echoic**	**Mixed Echoic**	**Areas of Calcification**	**Areas of cystic Degeneration**	**Shadowing + / -**

<u>CYST:</u>

Single	**Multiple**	**Anterior Myometrium**	**Posterior Myometrium**	**Depth of myometrial invasion**

Description of the lesion:

Bladder wall indentation: **+ / -**

Cervix : Normal / Abnormal

Mass: + / -

Nabothian cyst:

OVARIES: RIGHT / LEFT

Visualised:

Mass:

COLOUR DOPPLER:

MAGNETIC RESONANCE IMAGING:

UTERUS:

Borders:

Size:

Uterine symmetry:

Maximal junctional zone thickness:

Junctional zone thickness to myometrial thickness ratio:

LESIONS MYOMETRIUM:

T_1 WEIGHTED: **T_2 WEIGHTED:** **OTHER SEQUENCE:**

ENDOMETRIUM: **uniform** **focal thickening**

ENDOMETRIAL CAVITY: **normal** **distorted**

FLUID: **+ / -**

CERVIX:

Contour:

Mass:

Soft tissue stranding:

Extension:

Uterine **vaginal** **parametrium**

LYMPHADENOPATHY/ASCITES

OVARIES: **RIGHT (N/ABN)** **LEFT (N/ABN)**

IF ABNORMAL LESION DESCRIPTION:

TREATMENT:

1. **FRACTIONAL CURETTAGE / D & C**
2. **FOCAL RESECTION**
3. **HYSTERECTOMY**
4. **CERVICAL BIOPSY**

DETAILS OF TREATMENTS: OPERATIVE FINDINGS

HISTOPATHOLOGY REPORT:

<u>FINAL OUTCOME:</u>

CLINICAL DIAGNOSIS:

TRANSABDOMINAL USG DIAGNOSIS:

TRANSVAGINAL USG DIAGNOSIS:

COLOUR DOPPLER:

MRI DIAGNOSIS:

PEROPERATIVE DIAGNOSIS:

HISTOPATHOLOGY DIAGNOSIS:

MASTER CHART I A

S.NO.	NAME	AGE	COMP.	M. PAUSE	M. PHASE	CYC	DYS. MEN	MASS P/A	CERVIX P/S	UTE SIZE P/V	UT SIZE			CO
											USG	TV	MRI	USG
1	Kalyani	30	1,2,4	1	3	1	1	0	4	1	2	2	2	
2	Kamali	39	1	1	2	1	1	0	0	1	2	2	2	
3	Kamatchi	47	2	2	0	2	1	0	0	0	1	1	1	
4	Rani	37	1,2,3	1	3	1	1	1	6	1	2	2	2	
5	Hemavathy	51	1	2	0	1	0	0	0	1	2	2	2	
6	Valli	53	2	2	0	2	0	0	6	0	1	1	1	
7	Salma	40	1	2	0	1	0	0	0	0	2	2	2	
8	Vimala	42	1	1	3	1	1	0	0	0	2	2	2	
9	Selvi	40	1,2	1	3	1	0	0	0	1	2	2	2	
10	Saroja	38	1,4	1	2	1	0	0	0	1	2	2	2	
11	Sheela	35	0	1	3	1	1	0	0	1	2	2	2	
12	Ambika	38	0	1	2	1	0	0	0	1	2	2	2	
13	Suryakumari	40	1	1	1	1	0	0	0	1	2	2	2	
14	Danammal	65	1	2	0	1	0	0	0	0	1	1	1	
15	Kannammal	50	1,4	1	3	1	0	0	7	1	1	1	1	
16	Latha	36	4	1	3	1	0	0	0	0	2	2	2	
17	Sheela boopathy	35	1	1	2	1	1	0	0	0	2	2	2	
18	Sayamma	50	1	2	0	1	0	0	0	0	1	1	1	
19	Bhavani	32	1	1	2	1	1	0	0	0	2	2	2	
20	Kanagalatha Das	31	1,2	1	3	1	1	0	0	1	1	1	1	
21	Latha Raju	35	1	1	2	1	1	0	0	1	2	2	2	
22	Nagapoosanam	52	1,2,4,6	2	0	1	0	0	7	0	1	1	1	
23	Tulasi	30	1,2	1	3	2	1	0	0	1	2	2	2	
24	Rajammal	61	4	2	0	2	1	0	8	1	2	2	2	

MASTER CHART I B

S.NO	EM		EM THICK		MRI JZ THICK	JZ/MY RATIO %	EM CAV FLUID			EM MASS LESION			MY INVASI	MYOMET ECHO		MYOMET MASS		
	USG	TV	USG	TV			USG	TV	MRI	USG	TV	MRI		USG	TV	USG	TV	MRI
1	1	1		7	11	23	0	0	0	0	0	0	N	2	2	1	2	2
2	2	2	6	6	9	17	0	0	0	0	0	0	N	1	1	0	2	2
3	1	3		9	5	13	0	0	0	0	2	1	2	1	1	0	0	0
4	1	1					0	0	0	0	0	0	N	2	2	2	2	2
5	1	4			8		0	0	0	0	0	0	N	2	2	2	2	2
6	3	3	18	21	N	N	0	0	0	1	1	1	3	1	1	0	0	0
7	2	2	4	4	6	14	0	0	0	0	0	0	N	1	1	1	2	2
8	2	2	8	8	5	11	0	0	0	0	0	0	N	1	2	2	2	2
9	2	2	10	10	8	13	0	0	0	0	0	0	N	1	1	1	2	2
10	2	2	9	9	6	11	0	0	0	0	0	0	N	2	2	2	2	2
11	2	2	9	9	5	7	0	0	0	0	0	0	N	2	2	2	2	2
12	1	4	8	8	6	9	0	0	0	0	0	0	N	2	2	2	2	2
13	2	2	3	3	6	8	0	0	0	0	0	0	N	2	2	2	2	2
14	3	3	22	26	3		0	0	0	1	1	1	2	1	1	0	0	0
15	2	2	5	5	5	11	0	0	0	0	0	0	N	1	1	0	0	0
16	2	2	11	11	10	23	0	0	0	0	0	0	N	2	2	1	1	1
17	2	2	13	13	6	15	0	0	0	0	0	0	N	2	2	2	2	2
18	4	4	12	12	7	15	0	0	0	1	1	1	0	1	1	0	1	1
19	2	2	8	8	13	31	0	0	0	0	0	0	N	1	2	0	0	0
20	1	2		7	22	43	0	0	0	0	0	0	N	2	2	1	2	2
21	2	2	8	8	13	26	0	0	0	0	0	0	N	2	2	2	2	2
22	2	2	4	4	4	12	0	0	0	0	0	0	N	1	1	1	0	0
23	1	4		5	4		0	0	0	0	0	0	N	2	2	2	2	2
24	1	1					1	1	1	0	0	0	N	1	1	0	0	0

MASTER CHART I C

S.NO	CYST DEG			SHADOW		CYST		CERVIX			NABOTHIAN CYST			CX MASS			OVARY			SI MI
	USG	TV	MRI	USG	TV	USG	TV	USG	TV	MRI	USG	TV	MRI	USG	TV	MRI	USG	TV	MRI	T_1
1	0	1	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	2
2	0	0	0	0	0	0	0	1	2	2	0	1	1	0	0	0	0	0	0	0
3								1	1	2	0	0	1	0	0	0	0	0	0	3
4	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0			0	0
5	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1
6								1	1	1	0	0	0	0	0	0	1	1	1	0
7	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	2	2	2	0
8	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0
9	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
10	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1
11	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0
12	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1
13	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0
14								1	1	1	0	0	0	0	0	0	0	0	0	0
15								2	2	2	0	0	0	1	1	1	0	0	0	0
16	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0
17	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	2	2	2	0
18	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
19						0	1	1	1	1	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	4
22								2	2	2	0	0	0	1	1	1	0	0	0	0
23	0	0	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1
24								2	2	2	0	0	0	1	1	1	0	0	0	0

MASTER CHART II A

S.NO.	NAME	AGE	COMP.	M. PAUSE	M. PHAS	CYC	DYS. MEN	MASS P/A	CERVI P/S	UTE SIZE P/V	UT SIZE		
											USG	TV	MRI
25	Sankari	35	1	1	2	1	0	0	3	1	2	2	2
26	Raviammal	35	1,2	1	2	2	1	0	3	0	2	2	2
27	Sambanthakumri	53	1,2,3,4,5,6	2	0	1	0	1	8	1	1	1	1
28	Nayinammal	57	2,4	2	0	1	0	0	8	1	2	2	2
29	Maragatham	38	1	1	2	2	1	0	0	1	2	2	2
30	Narayiniammal	59	2,4	2	0	1	0	0	8	1	2	2	2
31	Tamilarasi	36	1	1	2	1	1	0	0	0	2	2	2
32	Vijaya	38	0	1	2	1	0	0	0	1	2	2	2
33	Nagammal	64	2,4,6	2	0	1	0	0	7	0	1	1	1
34	Mathammal	38	1,3	1	2	1	1	1	0	1	2	2	2
35	Saratha	50	1	2	0	1	0	0	0	0	1	1	1
36	L.maheshwari	36	4	1	3	1	0	0	0	0	2	2	2
37	Karthiyayini	31	1,2	1	3	1	1	0	0	1	1	1	1
38	Priya	50	1,4	1	3	1	0	0	7	1	1	1	1
39	Nallamma	59	2,4	2	0	1	0	0	8	1	2	2	2
40	Santhalakshmi	53	2	2	0	2	0	0	6	0	1	1	1
41	Rajeshwari	61	4	2	0	2	1	0	8	1	2	2	2
42	Veerammal	42	1	1	3	1	1	0	0	0	2	2	2
43	Anandalakshmi	38	0	1	2	1	0	0	0	1	2	2	2
44	Karpagam	31	1,2	1	3	1	1	0	0	1	1	1	1
45	Kokila	40	1	2	0	1	0	0	0	0	2	2	2
46	Akilandeshwari	42	1	1	3	1	1	0	0	0	2	2	2
47	Kannathal	40	1,2	1	3	1	0	0	0	1	2	2	2
48	Sartaj	38	1,4	1	2	1	0	0	0	1	2	2	2
49	Parvathy	31	1,4	1	3	1	1	0	4	1	2	2	2
50	Maheshwari	38	1	1	2	2	1	0	0	1	2	2	2
51	Valarmathy	38	0	1	2	1	0	0	0	1	2	2	2
52	Tamilselvi	36	1	1	2	1	1	0	0	0	2	2	2

MASTER CHART II B

S.NO	EM		EM THICK		MRI JZ THICK	JZ/MY RATIO %	EM CAV FLUID			EM MASS LESION			MY INVASI	MYOMET ECHO		MYOMET MASS			IF MAS
	USG	TV	USG	TV			USG	TV	MRI	USG	TV	MRI		USG	TV	USG	TV	MRI	USG
25	1	2		6	5	12	0	0	0	0	0	0	N	1	1	0	0	1	0
26	1	2		8	5	11	0	0	0	0	0	0	N	1	1	0	0	0	
27	1	2		5	4	10	0	0	1	0	0	0	N	1	1	0	0	0	
28	1	1					1	1	1	0	0	0	N	1	1	0	0	0	
29	2	2	6	6	5	12	0	0	0	0	0	0	N	2	2	2	2	2	4
30	1	1					1	1	1	0	0	0	N	1	1	0	0	0	
31	2	2	8	8	14	31	0	0	0	0	0	0	N	1	2	0	0	0	
32	1	4	8	8	6	9	0	0	0	0	0	0	N	2	2	2	2	2	4
33	1	1			2	6	1	1	1	0	0	0	N	1	1	0	0	0	
34	2	2	7	7	8	14	0	0	0	0	0	0	N	2	2	2	2	2	4
35	4	4	12	12	7	15	0	0	0	1	1	1	0	1	1	0	1	1	
36	2	2	11	11	10	24	0	0	0	0	0	0	N	2	2	1	1	2	2
37	1	2		7	22	41	0	0	0	0	0	0	N	2	2	1	2	2	2
38	2	2	5	5	5	11	0	0	0	0	0	0	N	1	1	0	0	0	
39	1	1					1	1	1	0	0	0	N	1	1	0	0	0	
40	3	3	18	19			0	0	0	1	1	1	3	1	1	0	0	0	
41	1	1					1	1	1	0	0	0	N	1	1	0	0	0	
42	2	2	8	8	5	11	0	0	0	0	0	0	N	1	2	2	2	2	2
43	1	4	8	8	6	9	0	0	0	0	0	0	N	2	2	2	2	2	4
44	1	2		7	19	38	0	0	0	0	0	0	N	2	2	1	2	2	2
45	2	2	4	4	6	14	0	0	0	0	0	0	N	1	1	1	2	2	2
46	2	2	8	8	5	11	0	0	0	0	0	0	N	1	2	2	2	2	2
47	2	2	10	10	8	13	0	0	0	0	0	0	N	1	1	1	2	2	2
48	2	2	9	9	6	11	0	0	0	0	0	0	N	2	2	2	2	2	4
49	1	1		7	11	23	0	0	0	0	0	0	N	2	2	1	2	2	2
50	2	2	6	6	5	12	0	0	0	0	0	0	N	2	2	2	2	2	4
51	1	4	8	8	6	9	0	0	0	0	0	0	N	2	2	2	2	2	4
52	2	2	8	8	14	29	0	0	0	0	0	0	N	1	2	0	0	0	

MASTER CHART II C

S.NO	CYST DEG			SHADOW		CYST		CERVIX			NABOTHIAN CYST			CX MASS			OVARY			SI IN MRI	
	USG	TV	MRI	USG	TV	USG	TV	USG	TV	MRI	USG	TV	MRI	USG	TV	MRI	USG	TV	MRI	T_1	T_2
25								0	2	2	1	1	0	0	1	1	0	0	0	0	5
26								2	2	2	0	0	0	1	1	1	0	0	0	0	4
27								2	2	2	0	0	0	1	1	1	2		0	0	6
28								2	2	2	0	0	0	1	1	1	1	1	1	0	2
29	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
30								2	2	2	0	0	0	1	1	1	1	1	1	0	2
31						0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	2
32	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
33								2	2	2	0	0	0	1	1	1	0	0	0	0	2
34	0	1	1	1	1	0	0	1	1	1	0	0	0				0	0	0	0	1
35	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
36	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	1	1	1	0	1
37	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1
38								2	2	2	0	0	0	1	1	1	0	0	0	0	2
39								2	2	2	0	0	0	1	1	1	1	1	1	0	2
40								1	1	1	0	0	0	0	0	0	1	1	1	0	2
41								2	2	2	0	0	0	1	1	1	0	0	0	0	2
42	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0	3
43	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1
44	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1
45	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	2	2	2	0	1
46	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0	3
47	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
48	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1
49	0	1	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	2	2
50	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
51	0	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
52						0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	2

KEY TO MASTER CHART

1.	COMP	Presenting complaints	-	Pain	-	1
				Bleeding PV	-	2
				Mass	-	3
				Discharge PV	-	4
				Loss of weight	-	5
				Loss of appetite	-	6
2.	M.PAUSE	Menopausal status	-	Premenopausal	-	1
				Post menopausal	-	2
3.	M.PHASE	Menstrual phase	-	Menstrual phase	-	1
				Proliferative phase	-	2
				Secretory Phase	-	3
4.	CYC	Cycle	-	Regular	-	1
				Irregular	-	2
5.	DYS.MEN	Dysmenorrhoea	-	Present	-	1
				Absent	-	0
6.	MASS P/A	Perabdominal mass	-	Present	-	1
				Absent	-	0
7.	CERVIX P/S	Perspeculam cervix	-	Normal	-	0
	Ulcer –1, Mass – 2, Polyp –3, Discharge –4, Bleeding – 5, Congested – 6, 2 and 4 is 7, 2 and 5 is 8.					
8.	UTE SIZE P/V	– Pervaginum uterine size		Normal	-	0
				Enlarged	-	1
9.	UT. SIZE	Uterine size	-	Normal	-	1
				Enlarged	-	2
10.	CONTOUR		-	Regular	-	1
				Irregular	-	2
11.	SYMMETRY			Symmetric	-	1
				Asymmetric	-	2
12.	ENDOMETRIUM			Not seen	-	1

		Homogenous	-	2
		Inhomogenous	-	3
13. EM. THICK	Endometrial thickness in mm			
14. MR JZ THICK	MRI Junctional zone thickness in mm			
15. JZ / MY RATIO	Junctional zone to myometrial ratio in %			
16. EM.CAV.FLUID	Endometrial	Present	-	1
	Cavity fluid	Absent	-	0
17. EM MASS	Endometrial mass	Present	-	1
		Absent	-	0
18. MY.INVASI	Myometrial invasion	Not applicable	-	N
		Absent	-	1
		< 50%	-	2
		> 50%	-	3
19. MYO.MET. ECHO	Myometrial echo	Homogenous	-	1
		Inhomogenous	-	2
20. MYO.MET.MASS	Myometrial mass	Absent	-	0
		Ill defined	-	1
		Present	-	2
21. If MASS		Submucus	-	1
		Intramural	-	2
		Subserosal	-	3
		2&3=4, 1&2=3=5, 1&2=6.		
22. ECHO		Isointense	-	1
		Hypointense	-	2
		Hyperintense	-	3
		Mixedintense	-	4
23. CALC -	Calcification in myometrial mass			
CYST DEG –	Cystic degeneration in myometrial mass			
SHADOW -	shadowing in Myometrial mass			
CYST -	Myometrial cyst	Present	-	1

			Absent	-	0
24. CERVIX			Not visualized	-	0
			Normal	-	1
			Abnormal	-	2
25.NC in CX		Nabothian cyst	Present	-	1
MASS CX		Cervical mass	Absent	-	0
26.OVARY			Normal	-	0
			Cyst	-	1
			Mass	-	2
			Not seen	-	N
27.SI in MRI	-	Signal intensity in MRI:			
T_1 w	-	T_1 weighted			
T_2 w	-	T_2 weighted	Isointense	-	O
			Hypointense	-	1
			Hyperintense	-	2
			Mixed intense	-	3
28. T”MT	Treatment /		Cervical Biopsy	-	2
	Methods of HPE		Endometrial curettage	-	3
		Myomectomy / polypectomy		-	4
			Hysterectomy	-	5
29. FINAL OUTCOME			Normal	-	0
			Adenomyosis	-	1
			Fibroid	-	2
			1 & 2	-	3
			Endometrial carcinoma	-	4
			Endometrial polyp	-	5
			4 & 5	-	10
			Cervical polyp	-	6
			Carcinoma cervix	-	7
			Inconclusive	-	8

USG - Transabdominal ultrasound TV - Transvaginal ultrasound

MRI -Magnetic resonance imaging.